tment of the Army

ARMY RD&A

MARCH - APRIL 1997

AMC's NEW PM MANAGEMENT STRUCTURE

INSIDE

- New Fast Track Initiative
- TACOM Mission Overview
- The Single Process Initiative

From The AAE. . .

Sustaining the Momentum

Acquisition reform is a continuing priority of the Department of Defense and the Department of the Army. On March 17, we begin Acquisition Reform Week, and our focus is on teaming as the catalyst for making acquisition improvement the norm. This is a good time to:

- Review what initiatives we've accomplished;
- Cite some specific success stories; and
- Let all of you know that Army acquisition is a great team.

You are the backbone of Army modernization. We have made great progress as a team. Now, we have to sustain the momentum.

We all remember the Defense acquisition process that existed before these reforms were initiated—paperwork-intensive, overly managed, and costly. The rule-based, risk-averse mindset that created this process boxed all of us in to the point where equipment was obsolete before we could get it into the hands of the soldiers who needed it.

Since those days and with severely constrained resources, we have dedicated ourselves to making the difficult and critical cultural changes that are essential to ensuring that our military forces remain the preeminent military power in the world. Let me briefly review some of the Army acquisition team's successes. They include:

- Eliminating "boiler plate" in the terms and conditions of our Requests for Proposals and contracts, and retaining only those that reflect our minimum essential requirements;
- Reducing substantially our demands for contract data requirements;
- Converting to single processes in our Defense manufacturing plants, so that all Services and contracts employ single standards, commercially-based where possible, for processes, manufacturing management, and quality;
- Vastly streamlined oversight;
- Adoption of a teamwork philosophy using Integrated Product Team management;
- Continuing the shift from lowest priced source selections to real emphasis on best value procurements;
- Treating cost as an independent variable in conjunction with the requirements generation process and with schedule and performance in program management; and
- Emphasizing post-award debriefings and alternative dispute resolutions to avoid the costs of formal contract protests.

There are hundreds of examples of what has happened when we applied these acquisition reform initiatives. Following are a few highlights:

America's Army is the federal government's greatest user of the International Merchant Purchase Authorization Card or IMPAC for purchases under $2,500. The Army leads the way in the use of credit card purchases and the **U.S. Army Forces Command (FORSCOM)** leads the Army! In fiscal year 1996 (FY96), we had the U.S.Army Audit Agency study the costs associated with obtaining goods and services using IMPAC instead of a purchase order. The Agency determined that each credit card transaction resulted in a savings of $92.60. With more than two million transactions projected for FY96 and using the 80 percent usage goal established by the Army Chief of Staff, this resulted in more than $173 million in savings.

In FY97, FORSCOM expects to use the credit card for 95 percent of all actions under $2,500 (approximately 617,000 actions) for a projected savings of $72.5 million over the traditional method of issuing purchase orders. It is no wonder why we are expanding the use of IMPAC Army-wide, and seeking to increase the threshold for using it.

Personnel from the **Program Executive Office for Ground Combat and Support Systems** are teaming very effectively with counterparts at the **Tank-automotive and Armaments Command** in using acquisition reform techniques to meet the Army's needs for M1A2 tanks. Our tight budget allowed a production rate of 97 tanks a year—insufficient to meet the Army's need. So, the Abrams team—government and industry partners—went to work and developed a variety of innovative approaches, including performance-based contracting, judicious reduction of military specifications and standards, best value source selection, reduction of data requirements and deliverables, and multiyear contacts, to provide the Army with 120 M1A2 tanks a year.

PM Bradley's Command and Control Vehicle program took advantage of "combined testing," leveraging off Task Force XXI experiments and previously scheduled tests to gain crucial data at minimum cost. The result: needed data gathered on time at a cost savings of more than $4 million as compared to conventional test methods. And, there is the potential for even greater savings.

At the **Program Executive Office, Intelligence, Electronic Warfare and Sensors,** acquisition reform is the key to meeting our soldiers needs—now! Last September, two newly procured Airborne Reconnaissance Low systems with Moving Target Indicator radar (ARL-MTI) were successfully deployed by the Army Intelligence and Security Command to U.S. Forces-Korea. These systems were acquired and fielded in less than nine months using acquisition streamlining techniques to meet an urgent CINC requirement for indications and warnings capability to replace the retiring MOHAWK. Major commercial items included the platform, which is a modified commercial deHavilland Dash-7 aircraft, and an off-the-shelf Moving Target Indicator/Synthetic Aperture Radar. There are many more outstanding examples of acquisition reform success stories just like these from across the Army. Time and space simply will not permit their telling.

All of these examples demonstrate clearly that the Army acquisition team thinks "outside the box" to identify new and promising ways to do business. We must not relax our vigil because good initiatives require continuing improvement. When you have a good idea and see a way to improve your operation, get your team together and do it! Then, let us know so we can trade it around! I call to mind a much used cliché: "Success is a journey, not a destination." To remain efficient and ensure that we continue to improve and adopt new ways to do business, requires continuous process improvement. We have got to work daily to get the goals tighter and better. We must and will sustain the momentum.

Gilbert F. Decker

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03150

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FEATURES

DEPARTMENTS

COVER

The Army Materiel Command's (AMC) new PM management structure re-establishes AMC as a major player in the systems acquisition and development process.

PMs BEGIN TRANSFER TO THE ARMY MATERIEL COMMAND

By LTC(P) Leon A. Parker, III

Introduction

The Army acquisition community is undergoing major changes as it races to meet the requirements of acquisition reform and the 21st century. To enable Headquarters, Department of the Army (HQDA) to more effectively and efficiently perform Title 10 functions in the 21st century, and achieve the recommendations of the HQDA Redesign Functional Area Assessment (FAA). The HQDA Redesign FAA focused on reducing the size of HQDA, reducing the number of field operating agencies and staff support agencies, reducing missions, functions, costs, and positioning the Army to enter the information age of the 21st century. The Army Acquisition Executive initiated the Army Science Board (ASB) study to reengineer the acquisition and modernization process of the institutional Army. The ASB's focus was on acquisition, research and development, training, wholesale logistics, test and evaluation, and doctrine/requirements.

Implementation of ASB Initiatives

A jointly signed Oct. 1, 1996 memorandum by the Army Acquisition Executive, Gilbert F. Decker, and the AMC Commanding General, GEN Johnnie E. Wilson, provided the following directives:

- Effective no later than Oct. 1, 1997, the number of PEOs reduces from nine to seven with the consolidation of PEOs, Armored Systems Modernization, Tactical Wheeled Vehicles, and Field Artillery Systems. The consolidated PEO will be named Ground Combat Support Systems (GCSS). Also, by the end of 4th Quarter FY98, the Standard Army Information Management Systems (STAMIS) mission will transfer to AMC.
- The remaining PEO structures will retain management responsibility of ACAT I and related ACAT II/III programs. All other ACAT II/III programs will be transferred to the appropriate AMC commodity command.
- To support the expanded acquisition mission within AMC, the Chief of Staff of the Army has approved the establishment of three brigadier general (BG) positions titled, "Deputy for Systems Acquisition." To ensure zero growth in the general officer (GO) acquisition positions, three current GO positions were eliminated. The new BG "Deputy for Systems Acquisition" positions will be located at the U.S. Army Communication-Electronics Command (CECOM), Fort Monmouth, NJ; U.S. Army Tank-automotive and Armaments Command (TACOM), Warren, MI; and the U.S. Army Missile Command (MICOM), Redstone Arsenal, AL. As a result of Base Realignment and Closure 95, the U.S. Army Aviation and Troop Command (ATCOM), St. Louis, MO, and MICOM will merge at Redstone Arsenal, AL, and will be known as the Aviation and Missile Command (AMCOM). The new brigadier generals are scheduled to arrive at their respective commands as follows: TACOM—January 1997; AMCOM—March-April 1997; and CECOM—approximately June/July 1997.
- Program funds will flow from Headquarters, Department of the Army, to the Deputies for Systems Acquisition, who will exercise the same reprogramming authority as currently delegated to the PEOs. There will be no reprogramming of funds outside of the research, development and acquisition (RD&A) accounts without coordination with the Office of the ASARDA.

AMC In Charge Of Transfer

The Oct. 1, 1996 jointly signed memo assigns the responsibility for the execution of the transfers to Headquarters, AMC. On Oct. 2, 1996, the CG, AMC signed a memorandum providing the initial directives on the execution of the transfers.

A Headquarters, AMC Project Management Office (PMO) Transition Team was formed under the AMC Deputy Chief of Staff for Research Development and Acquisition (DCSRDA), MG Roy E. Beauchamp. The Director of Program Management and Acquisition Support, in AMC's Office of the DC-

SRDA, COL Richard Bregard, chairs this team with participants from HQ AMC—the Office of the Deputy Commanding General (Principal Deputies for Acquisition, Logistics and Technology); the Command Counsel; the Office of the DCSRDA; Office of the Deputy Chief of Staff for Personnel; and the Special Analysis Office. Additionally, ATCOM, CECOM, MICOM, and TACOM participate.

Department of the Army participation includes the following ASARDA offices:

- The Deputy for Systems Management and International Cooperation;
- The Deputy Assistant Secretary for Plans, Programs and Policy;
- The Deputy for Combat Service Support;

Included also are participants from the following offices:

- The Assistant Secretary of the Army for Financial Management and Comptroller (FM&C);
- The Assistant Secretary of the Army for Manpower and Reserve Affairs (M&RA);
- The Assistant Secretary of the Army for Installations, Logistics and Environment

(continued on page 4)

Interview With A Transferring Product Manager...
E. Carroll Gagnon
Product Manager
Paladin/Field Artillery
Ammunition Support Vehicle

The Product Management Office (PMO), Paladin/Field Artillery Ammunition Support Vehicle (FAASV) is currently assigned to the Program Executive Office, Ground Combat Support Systems (PEO, GCSS). Prior to the PEO consolidation, PMO Paladin/FAASV was under PEO Field Artillery Systems. Paladin/FAASV is one of the 19 PEO PMs scheduled to be transferred to AMC prior to Aug. 30, 1997.

Q: What are the key events that your program will undertake this fiscal year (FY97)?

A: Fiscal Year 97 will be another busy year. Just a few of the key events this year are:

- The award of a new production contract for Paladin in March 1997;
- The award of a new European production contract for FAASV Inspect and Repair Only as Necessary (IRON) in March/April 97;
- Fielding of Paladins and FAASV to Korea, 2d ID (Fort Lewis, WA), III Corps (Fort Sill, OK), and start of the process to 1st ID (Germany);
- The start of fielding to the Kansas, Georgia, and Mississippi National Guard in May 1997;
- Participating in the Field Artillery Control Vehicle/Fire Direction Control Vehicle Warfighting Rapid Acquisition Program Army Systems Acquisition Review Council, May 6, 1997.
- We will be involved in future foreign demonstrations and foreign military sales (FMS) buys are imminent; and
- Future National Guard Bureau buys are under debate.

Q: Your products are currently ACAT-II and III programs, with high visibility. Why do you think your program was one of the 19 selected to transfer to AMC?

A: The products are currently in full-scale production and fielding phases. All project dollars are Procurement Army (PA) and Operations and Maintenance, Army (OMA), no RDT&E line. Issues are no longer programmatic for the Army, schedule and cost are the primary execution issues.

Q: Your product receives the majority of its matrix support from AMC. Do you see a change (+ or -) to this support once you become a part of the AMC community?

A: Neutral—provided the issue of funding support with PA dollars is supported.

Q: What is your most major concern as it pertains to the transfer, and do you believe that AMC is taking steps to alleviate that concern?

A: The major concern I have is the OMA vs. PA issue related to matrix support. It is too early to tell if steps have been taken to resolve this issue. This was a major topic of discussion at the October 1996 AMC PM Conference held in St. Louis, and the AMC Resource Manager was tasked to come up with an acceptable solution.

Q: The AMC Commanding General, GEN Wilson, and LTG Hite, the Military Deputy to the Assistant Secretary of the Army (RDA), have made an agreement that the core PMO being transferred will not be touched for at least one year after the transfer. After that year, a joint SARDA and AMC team will review the PMOs for efficiencies. This was done as an effort to guarantee continuity of operations within the individual PM offices in the midst of downsizing activity within the AMC community. Do you have any comments to this decision?

A: I concur, though it has not been specified, the assumption is that the SARDA/AMC team will include PMs.

Q: What would be the one thing you would do at AMC to insure the success of this effort?

A: Don't get hung up on the grade levels within the PMOs. PMs must entice the brightest and motivated personnel to meet the challenges and compensate them accordingly. The quickest way to demoralize the organizations is to impact the current structure.

Q: Do you have any parting comments?

A: Having had the advantage of serving in a PEO for five years, in addition to having served in PM shops (13 and 5 years, respectively), I must emphasize empowerment. The PM develops and executes his mission and must be held accountable. Maintain surveillance without dictating. Personnel resources are the least cost to the program, therefore short-changing the staff is counter productive.

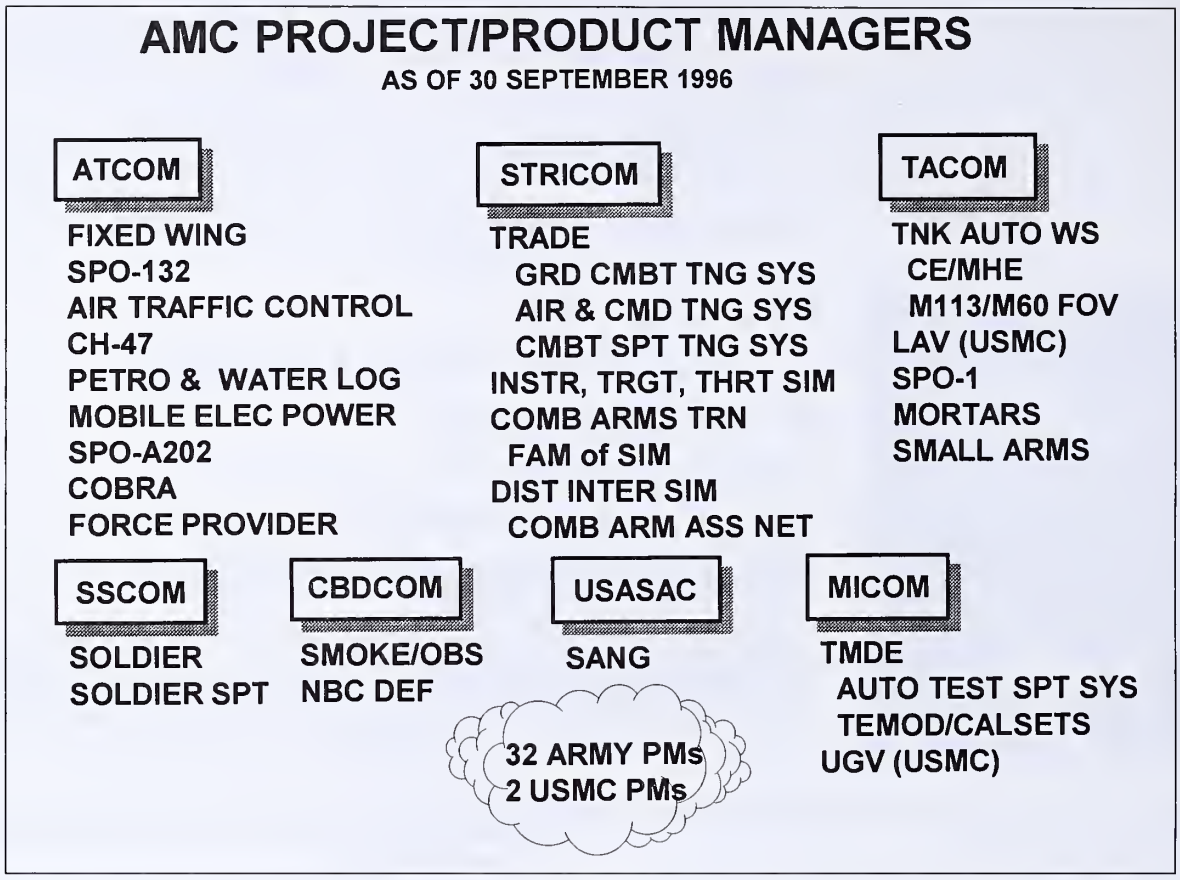


Figure 1.

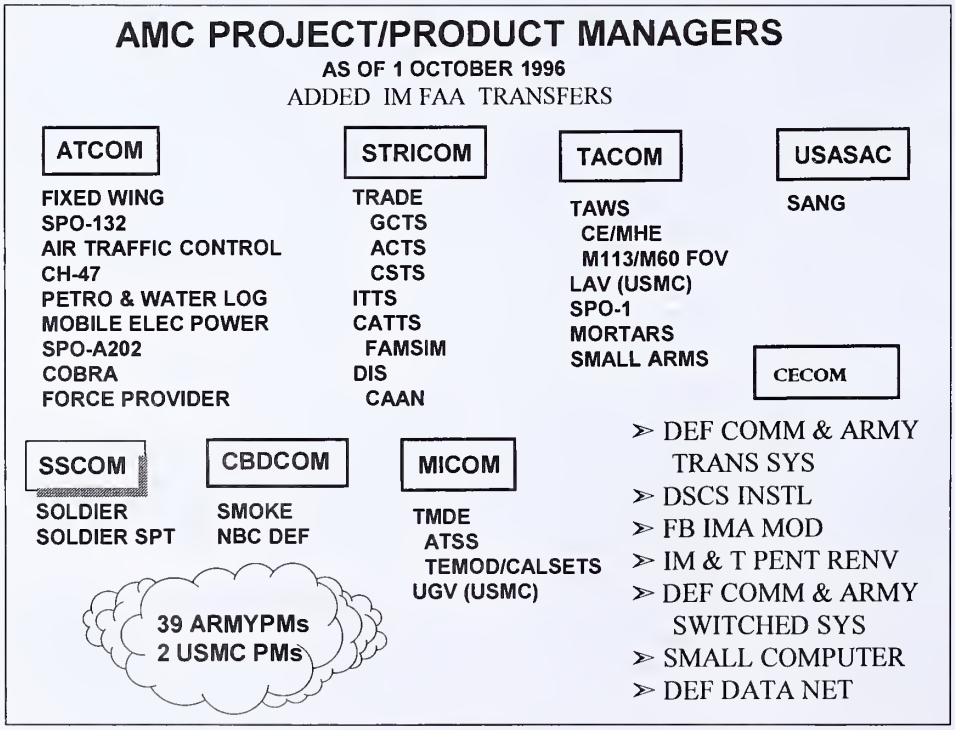


Figure 2.

(IL&E);

- Deputy Chief of Staff (DCS) for Personnel;
- DCS for Operations and Plans;
- DCS for Logistics,
- The Director of Information Systems for Command, Control, Communications and Computers;
- The Director, Program Analysis and Evaluation; and
- The General Counsel.

The AMC PMO Transition Team's scope of effort covers all aspects of the transition including physical moves, spaces, Pentagon representation, POM execution, budget and appropriations, transfer authority to include actual dates, method of execution, military and civilian personnel actions, and any other matters to insure that the transfer is completed by the designated Oct. 1, 1997 date, and that it is as seamless as possible for the transferring PMOs.

A General Officer Steering Committee (GOSC), chaired by AMC's Principal Deputy for Acquisition, Dale Adams, was formed to provide management oversight to the PMO Transition Team. The membership of the GOSC includes Deputies for Systems Acquisition (or appropriate substitutions pending

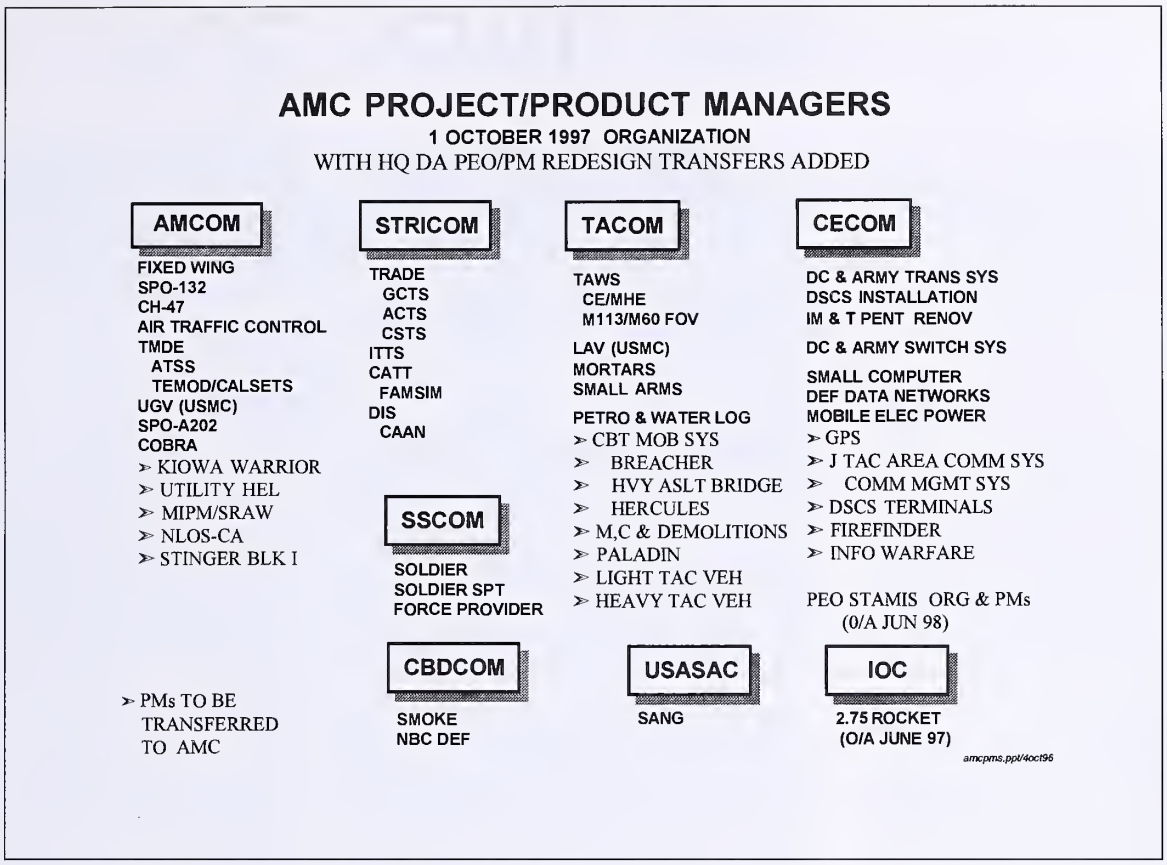


Figure 3.

the assignment of the new BGs) from CECOM, MICOM, and TACOM; the Deputy to the Commanding General of ATCOM; HQ AMC's Deputy Chiefs of Staff for Personnel, RD&A, and Resource Management; the Deputy Assistant Secretary for Plans, Programs and Policy; the Deputy for Systems Management and International Cooperation; and PEOs/deputies from the affected offices.

AMC As Of Sept. 30, 1996

AMC's structure on Sept. 30, 1996 was comprised of 32 Army ACAT II/III and two Marine Corps programs with board selected program managers within the seven subordinate commands. (See Figure 1.) As a result of the Information Management Functional Area Analysis (IM FAA), on Oct. 1, 1996, a total of seven ACAT III PMOs were transferred from Information Systems Command (ISC) to AMC-CECOM, increasing AMC's ACAT III PMOs to 39. (See Figure 2.)

PEO PM Transfers

As a result of actions starting in early CY97 and continuing through the end of FY97, there will be 19 PEO product and project offices transferred to AMC. Transferring into ATCOM/MICOM (AMCOM) from PEO, Aviation are Kiowa Warrior and Utility Helicopter. Stinger (Block-I), Non-Line of Sight - Combined Arms (NLOS-CA), and Multipurpose Individual Munitions/Short Range Assault Weapon (MIPM/SRAW) will also be transferred to AMCOM from PEO, Tactical Missiles. These five program offices and the ATCOM/MICOM merger, will increase the AMCOM PM total from 12 to 17.

TACOM will receive the Heavy and Light Tactical Vehicles PMOs from PEO, Tactical Wheeled Vehicles, and Combat Mobility Systems (with the Hercules, the Heavy Assault Bridge, and Breacher), Mines, Countermine and Demolitions, and the Paladin offices from PEO, Ground Combat Support Systems. TACOM's organization will grow from six to 14 ACAT II/III PM offices.

CECOM will receive Firefinder and Information Warfare from PEO, Intelligence, Electronic Warfare and Sensors, and Global Positioning System (GPS), Joint Tactical Area Communication System (JTACS), Communication Management System (CMS), and the Defense Satellite Communication System-Terminals (DSCS Terminal) from PEO, Command, Control and Communications Systems (C3S). CECOM will grow to a total of 13 PMOs in FY97. Additionally, in FY98, CECOM is scheduled to receive the former PEO STAMIS organization and its project offices. At the completion of FY98, CECOM will have grown to a total of 14 PMOs and AMC will have grown to a total of 59 ACAT II/III PM Offices. (See Figure 3.)

Conclusion

The transfer of PM Offices into AMC not only supports the goals of the Secretary of Defense as it pertains to force reduction and acquisition reform, but re-establishes AMC as a major (integral) player in the systems acquisition and development process. AMC is dedicated and committed to fulfilling this mission.

LTC(P) LEON A. PARKER III is a systems integration officer at Headquarters, AMC, Research, Development and Acquisition, Program Management Office. He holds a B.S. degree in mathematics from Morgan State University, Baltimore, MD, where he was a distinguished military graduate. Parker is a graduate of the Systems Automation Course, Command and General Staff College, and the Program Management Course, Defense Systems Management College and is a member of the Acquisition Corps.

FAST TRACK INITIATIVE

Do It Once, Do It Right, Do It Straight to EMD!

By Dr. A. Fenner Milton and LTC(P) Stephen V. Reeves

Introduction

Do it once, do it right, do it straight to EMD. That summarizes the Army's new Fast Track Science and Technology (S&T) Initiative to accelerate the transition of high-value, high-priority technology directly to the engineering, manufacturing and development (EMD) phase of systems acquisition. Consistent with the Army's and DOD's thrusts on tailoring the acquisition process, Fast Track provides the mechanism for streamlining the introduction of new technology into Army systems. Using the Fast Track approach also further minimizes the time required to satisfy the Army's warfighting requirements. The Fast Track Initiative accomplishes these goals by precluding the need for the Program Definition and Risk Reduction phase (milestone I) of systems acquisition (formerly called the Dem Val phase) and by transitioning directly to EMD technology that has been demonstrated in a robust Advanced Technology Demonstration (ATD).

Why Fast Track?

The ultimate goal of the Army Science and Technology Program is to provide the warfighter the winning edge on the battlefield. Closely linked with the Army Force Modernization Plan, the Science and Technology Program focuses on developing critical capabilities which address future warfighting needs, and delivering timely and affordable technologies supporting the upgrading of existing systems and the fielding of next generation and future systems.

But technology transition can present challenges. Technology must be demonstrated and risk retired before committing the program to engineering and manufacturing development. ATDs and Advanced Concept Technology Demonstrations (ACTDs) provide the opportunities for identifying and retiring program risk, addressing affordability issues, and analyzing the technology's military worth prior to transitioning the technology to systems development.

Yet, as potential warfighting technologies emerge from basic and applied research efforts, ready for demonstration, one of two situations frequently arise. In the first situation, the technology looks promising, but it is unclear whether the technology is needed in quantity. One solution to this situation is a very robust ACTD, including additional funding for safety testing, larger quantities for evaluation, and post demonstration support for residual capabilities. This may be combined with virtual prototyping, keeping the technology at the ready for future applications. This approach permits the warfighter to evaluate the technology's military utility and decide if an EMD program is justified.

In the second situation, the military need is clear from the beginning and the Army is committed to the application in quantity, but it is unclear exactly how the technology should be configured for the application. This is where the Fast Track process applies.

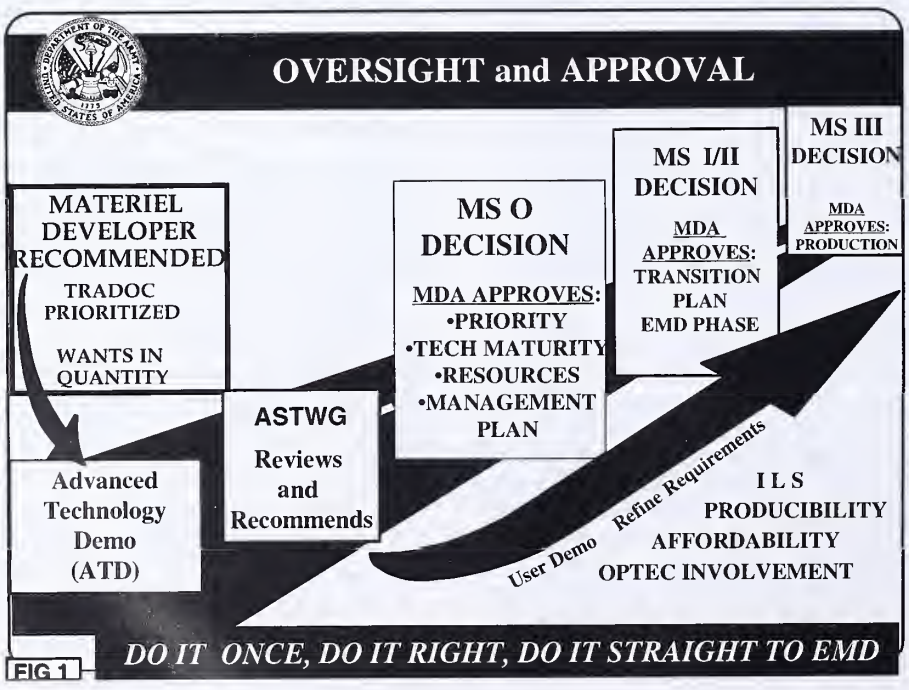


FIG 1

The Fast Track Process

The Fast Track process uses existing Army organizations and structures and applies to selected high priority applications of technology that are deemed moderate risk and ready for a robust S&T demonstration. Fast Track advanced technology demonstrations must have a reasonable likelihood of being ready to transition directly from the science and technology demonstration phase directly to Engineering and Manufacturing Development. Finally, the Army must be committed to the application as identified by a Future Operational Capability Requirement, and funding in the Program Objective Memorandum (POM) that covers the entire program all the way through production.

The Fast Track process begins with candidate technologies being approved as an Army Advanced Technology Demonstration. New ATDs are first reviewed and recommended by Headquarters, U.S. Army

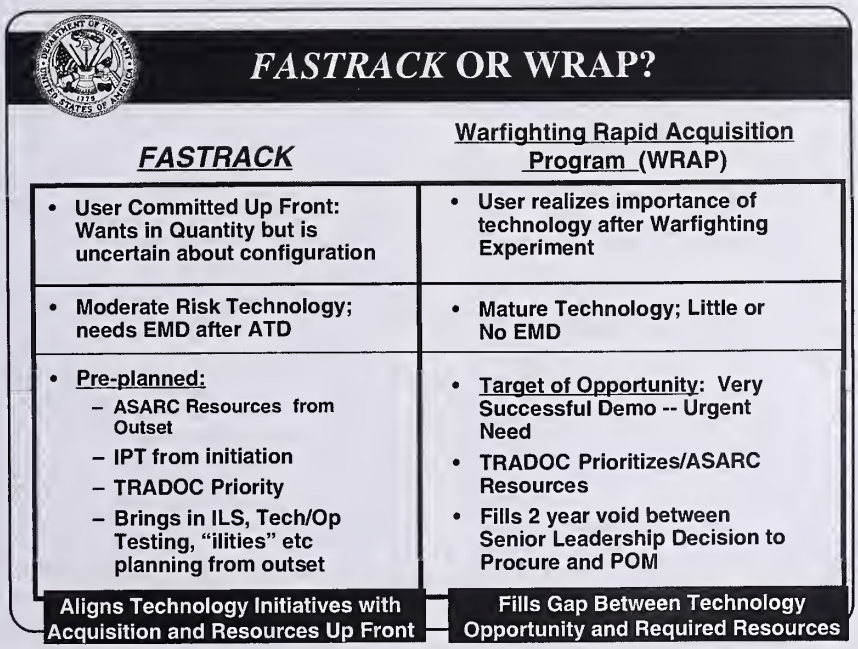
FAST TRACK OR WRAP?

Fast Track and the Warfighting Rapid Acquisition Program or WRAP are different, but complementary programs. (See accompanying figure.)

Fast Track begins with a demonstrational moderate risk technology, recognizing that post demonstration work is required in engineering and manufacturing development to ensure the technology meets all operational requirements as well as producibility, affordability and integrated logistics support requirements. The determination of need of a Fast Track candidate is not based on the results of a warfighting experiment. From program initiation as an S&T demonstration, the Army identifies the program's priority and commits the required resources, while coordinating technical and operational testing, integrated logistics support, and transition planning to avoid duplication of effort. In sum, Fast Track aligns technology demonstrations with the acquisition process from the outset.

The WRAP process begins at a later stage with mature technology requiring little or no engineering and manufacturing development. WRAP candidates are generally the result of very successful demonstrations that are often part of an advanced warfighting experiment, (AWE). After the technology demonstration, TRADOC then evaluates the program for WRAP and determines if the technology is sufficiently important to warfighting needs to transition the technology expeditiously to production. WRAP helps fill the gap between technology opportunity and identifying the required resources for procurement.

Both Fast Track and WRAP Programs must be prioritized and fully supported by TRADOC. Together, Fast Track and WRAP provide options for flexible, tailored approaches to technology integration and transition based on the systems size, risk, and complexity.



Training and Doctrine Command (TRADOC) and the materiel developer's major command, and are approved by the Army Science and Technology Working Group (ASTWG). The ASTWG is co-chaired by the Deputy Assistant Secretary for Research and Technology and the Assistant Deputy Chief of Staff for Operations and Plans (Force Development).

Once the ATD is approved by the ASTWG, and recommended as a Fast Track candidate, a Milestone 0 decision review body is convened. The review is performed by an Army Systems Acquisitions Review Council (ASARC) or In Process Review (IPR) as appropriate for the Acquisition Category of the program. The Milestone 0 decision review body evaluates the priority of the requirement and the maturity of the technology to determine if the candidate system warrants accelerated acquisition and full funding in the POM all the way through production. Recommendations of the review body are presented to the Milestone Decision Authority (MDA) for approval. The MDA is then asked to approve the Advance Technology Demonstration Plan, exit criteria, and the resources required to execute the entire program. The MDA also assigns a program executive officer or project manager (PEO/PM) to support the ATD manager. (See Figure 1 on page 6.)

Once the ATD is approved as a Fast Track Program, the ATD manager establishes an Integrated Product Team (IPT), including representatives from the combat developer and the TRADOC systems manager, technical and operational testers, and the gaining PEO or PM. This IPT addresses technical and operational testing, integrated logistics support issues, pre-planned product improvements, horizontal technology integration, affordability (including cost as an independent variable) and transition planning issues.

Concurrent with this IPT, the proponent combat developer establishes a multi-disciplinary Integrated Concepts Team (ICT). Initially, this ICT prepares the Mission Needs Statement presented to the Milestone 0 decision review body. By participating in the Advanced Technology Demonstration, the ICT gains insights and a better understanding of the "art of the possible." This provides the basis for refining and finalizing requirements and developing system performance objectives and thresholds in an Operational Requirements Document which need not be finalized until the beginning of EMD.

The post-Milestone 0 Science and Technology Phase continues for approximately one year beyond the conclusion of the Fast

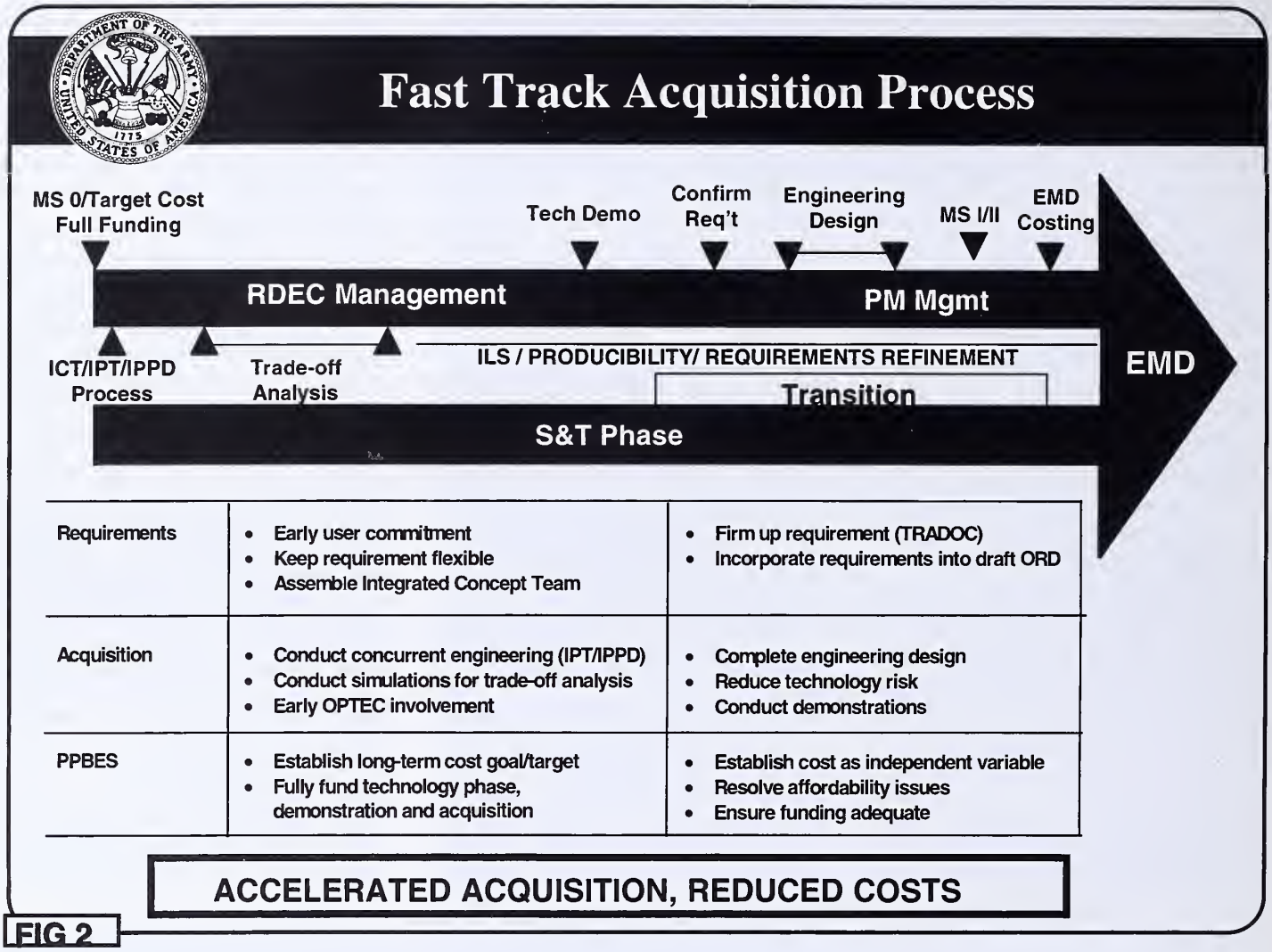


FIG 2

Track technology demonstration. This period is used to complete any risk reduction initiatives and to transition program management from the ATD manager to the PEO/PM. (See Figure 2.)

At the conclusion of this phase, a Milestone I/II decision review forum is held. The Milestone I/II decision review body determines if the results of the S&T phase warrant program continuation directly into engineering and manufacturing development. Their recommendations are prepared and forwarded for review and approval by the MDA. Once approved, the program follows normal life-cycle management requirements for Milestone III approval.

So What?

The Fast Track Initiative recognizes that most technology is not sufficiently robust to transition directly from the technology base to production. EMD is required to ensure the system meets producibility, affordability and operational requirements. However, if the S&T phase is sufficiently robust there is no need for the post milestone I program definition and risk reduction phase. Currently, the Future Scout and Cavalry Vehicle and Guided Multiple Launch Rocket System are pilot programs for the Fast Track approach.

So what? Fast Track offers significant advantages over more traditional technology transition approaches. Fast Track contributes to program stability by committing required program resources from the outset. Fast Track reduces overall costs by retiring risks early, thus permitting more stable requirements, and precluding the need for Milestone I activities. Most importantly, Fast Track results in a shorter overall acquisition cycle getting winning technology to the warfighter faster.

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LTC(P) STEPHEN V. REEVES is the Director of Science and Technology Integration, Office of the Assistant Secretary of the Army (Research Development and Acquisition). He holds an M.S. in adminstration from Central Michigan University, and an M.S. in national resource strategy from the Industrial College of the Armed Forces.

TACOM MISSION OVERVIEW

By MG Edward L. Andrews
Commanding General
U.S. Army Tank-automotive
And Armaments Command

Introduction

"If it requires mobility or firepower—it's ours," say proud members of the U.S. Army Tank-automotive and Armaments Command (TACOM) in briefly summarizing the scope of TACOM's myriad missions.

More precisely, to support the Army's readiness, the TACOM mission is to research, develop, field and support ground mobility and armament systems through their total life cycles—this includes all combat and tactical vehicles, trailers, construction equipment, materiel handling equipment, tactical bridges, fuel and water distribution equipment, sets, kits and outfits, shop equipment, chemical defense equipment, howitzers, large-caliber guns, mortars, rifles, machine guns, handguns, aircraft armament, demolitions and explosives.

Future Oriented

A major subordinate command of the Army Materiel Command, TACOM is "Committed to Excellence" in the total-force endeavor of taking America's Army into the 21st century. To help ensure the Army is a properly equipped, strategic force capable of power projection and decisive victory, TACOM's vision is to be the world leader in development, acquisition and support of mobility and armament systems.

TACOM is big business—consisting of more than 9,000 military and civilian professionals, stewarding FY96 resources of some $5 billion, $3.8 billion in contracts; managing 39,261 items; filling 800,000 requisitions a year; working on 10 Advanced Technology Demonstrations, and maintaining daily interactions with both customers and suppliers worldwide, TACOM compares with a Fortune 500 top-10 concern.

Consistent with the business framework, TACOM is composed of 10 subordinate business organizations. They are partnered with Army program executive officers (PEOs) in relationships tailored to efficiently and effectively provide the best total life cycle (from the drawing board stage to the gates of the disposal yard) management of mobility and armament systems.

Equipment Management

In a product/functional area teaming matrix, 21 percent of the TACOM force works in support of PEO elements dedicated to intensely managed, high profile and emerging combat and tactical vehicles and armament systems. This includes the Abrams M1-Series Tanks, Bradley Fighting Vehicles, the new Family of Medium Tactical Vehicles, the HMMWV and the Paladin and Crusader field artillery systems.

Legacy systems such as the M113 Armored Personnel Carrier, M9 Armored Combat Earthmover and M60 Tank families of vehicles, along with trucks, trailers, construction and materiel-handling equipment, and a number of allied security assistance programs are managed within TACOM's and the Army's newest project manager, PM, Tank Automotive Weapon Systems. Another TACOM business organization is dedicated to the U.S. Marine Corps Light Armored Vehicle Program.

In addition, 4,666 major and 34,595 secondary items are managed by readiness/sustainment-oriented elements at two business centers. For mobility systems, this is accomplished in the Integrated Materiel Management Center, located at the Detroit Arsenal in Warren, MI. For armament and chemical items, the center involved is the Armament and Chemical Acquisition and Logistics Agency (ACALA), located at Rock Island Arsenal, IL. Together, the life cycle-oriented TACOM/PEO team fulfills significant portions of the Army Materiel Command's three core competencies:

- Technology generation and application;
- Acquisition excellence; and
- Logistics power projection.

As a system evolves through its life cycle, so does the competency being emphasized—early on in the life cycle, the strong emphasis is on R&D. Later, acquisition becomes the focal point. The emphasis may change, but to some degree, all three competencies are exercised throughout.

Technology Generation

Given the current and probable future reduced force structure, technology, and the modernization it allows, is a force multiplier that is increasingly critical for decisive victory and other Army mission accomplishments.

TACOM has two Presidential Quality Award-winning business centers dedicated to this vital core competency. Collocated with command headquarters at the Detroit Arsenal in Warren, MI, is the Tank-Automotive Research, Development and Engineering Center (TARDEC).

Winner of the President's Quality Award in 1995, TARDEC, comprised of some 1,100 professionals, is the leader in military ground vehicle technologies. TARDEC's science and technology strategy is to achieve Force XXI goals by emphasizing efforts to:

- Lighten the force by using equipment incorporating composites, ceramics and other non-armor survivability technologies.
- Digitize intra-vehicular electronics, power management—use smart weapons and automated crew functions.
- Deploy robotics, electric vehicles, lightweight structures and smaller crews.
- Leverage collaborative advanced automotive technologies to meet the dual needs of military customers and commercial industry.

TACOM's Armament Research, Development and Engineering Center (ARDEC), comprised of 3,800 professionals, is located at Picatinny Arsenal, NJ. Winner of a Presidential Quality Award in 1996, ARDEC focuses on integrating cutting edge technologies into combat systems such as medium caliber guns, fire control systems and munitions.

ARDEC's science and technology strategy is to provide Force XXI with rapid, digitized firepower to dominate maneuver. Among its highest priorities, ARDEC seeks to improve soldier lethality, reduce the load especially for light forces, improve ammunition resupply and produce innovation in the areas of smart weapons and less-than-lethal weapons.

Bringing mobility and firepower research elements under "one roof" creates synergy. Among the programs/endeavors benefited by the coupling are: Composite Armor Vehicle, Hit Avoidance, Intelligent Minefield and Precision Guided Mortar Munitions. TACOM's RD&E efforts are at the heart of the Army's reshape concept, Force XXI.

Unique Capabilities

TACOM's RD&E resources are unique, world-class. The Department of Defense Research and Engineering Laboratory Study identified three of TARDEC's unique, "national-treasure" capabilities—the Crewstation Turret Motion Base Simulator; Engine Test Cell #9's Full Load Cooling Test Facility, and the Bridge Load Frame.

The Chassis and Running Gear Laboratory exploits advanced composite materials and technologies to improve mobility for future vehicles. Several robotics initiatives are leveraging technology and conducting cooperative research to achieve superhuman performance and intelligence in mechanical systems.

The *Electric Armaments Research Center* has a 52 megajoule capacitor-based power source—the world's largest to be dedicated solely to the electric gun.

The *Advanced Materials Laboratory*

will meet the lightweight composite structure demands for all vehicles in the future. And, in the *Vehicle Survivability Laboratory,* new and revolutionary materials, techniques and unconventional technologies are being exploited to achieve near invisibility despite sophisticated surveillance technologies and techniques.

The new *Advanced Warhead Development Facility* will be used to test shaped-charge and other anti-armor warheads and missiles. This facility, as well as a unique *Energetic Materials Facility,* are designed to be environmentally safe.

The *Vehicle Electronics (Vetronics) Laboratory* develops and leverages technologies to reduce the number, size and weight of components, enhance communications and conserve resources.

The *Simulation and Virtual Prototyping Laboratory* continuously improves our virtual reality and design capabilities.

The command also includes a state-of-the-art supercomputer facility, which includes a Cray II Supercomputer, used as a DOD-shared, high-performance computing site and in the design and development of armored vehicles. It permits scientists and engineers to conduct an advanced range of highly realistic simulations, including those designed to study warhead and projectile effects on armor; and others related to terrain effects on mobility systems. The facility has been used in numerous endeavors involving the private and academic sectors.

Acquisition

Challenges in the procurement arena are nothing new to TACOM. Yet, budgetary constraints, frequency and speed of deployments and the radically reduced force have brought the Army challenges that TACOM acquisition elements are wrestling to overcome.

The command adopted a three-pronged streamlining strategy:

- Eliminate non-value added requirements such as MILSPECs and contract data requirement items;
- Reduce administrative and production lead times; and
- Eliminate roadblocks to sound business practice.

Then the command focused on initiatives to achieve significant and measurable continuous improvements—results. Areas successfully worked include:

Partnering/Teaming—The command entered into formal partnering agreements and has teaming arrangements with seven major contractors—AM General, Goodyear, UDLP, Texas Instruments, Textron, Trak International and Caterpillar. This initiative immediately reduced the number of conflicts and contributed to closer cooperation on other initiatives.

Contract Consolidation—By writing fewer contracts (29,000 rather than 38,000) which cover more items for longer periods of time and by using requirements contracts and contract options, TACOM estimates that costs have been reduced by 15 percent. In FY95 TACOM spent 43 percent of its spare parts' dollars on long term contracts. The percentage increased to 50 percent in FY96.

Streamlining of Requirements—By using a "value added yardstick" and questioning the individual contextual need for application/inclusion of MILSPECs and other government-unique requirements, TACOM has improved coordination and cooperation with industry at the same time it saved millions of dollars. A sampling of 10 recent solicitations indicated reductions ranging from 50 to 85 percent in MILSPEC and data requirements. The projected, estimated savings are substantial.

Of the more than 5,000 MILSPECS TACOM was responsible for, 565 have been canceled, 1,395 have been inactivated for procurement of new items, 80 have been converted to performance specifications and 141 have been converted to commercial-item descriptions, since 1994.

Best Value Contracting—By institutionalizing proven best practices, TACOM has consistently cut proposal-to-award time by 60 to 90 days; reduced involved manpower by about 50 percent, and chalked up estimated savings of $1 million per year. Proven best practices include resource limiting criteria, better proposal instructions and disciplining the evaluation process.

Direct Vendor Delivery and Electronic Data Interchange—Using modern electronic technology, starting with the supply of tires and having a goal of expanding to include additional high volume items, TACOM has electronically ordered and shipped direct from vendor to using unit approximately 136,000 tires. This program has reduced on-hand tire inventories by more than 50 percent and production lead time to about a month.

TACOM is continuously working on these and additional reforms too numerous to describe here. In addition to millions of dollars in cost avoidance, TACOM has already reduced administrative and production lead time by 41 percent since FY90 and fully expects to bring that to 50 percent within the next year. As testimony to TACOM's acquisition excellence, command elements and individuals at TACOM-Warren, TACOM-ACALA and TACOM ARDEC have recently won Vice President Gore's Hammer Awards.

Lead time is a pipeline issue, directly and immediately affecting unit readiness and deployability. It is, therefore, logical at this juncture to shift into the third TACOM core competency, which is primarily stewarded by the Integrated Materiel Management, the Program Manager Tank Automotive Weapon Systems, and the Armament Chemical, Acquisition and Logistics Activity business centers.

Logistics Power Projection

In a nutshell, TACOM performs integrated, streamlined and synchronized management of logistics systems to ensure that the soldier in the field has the equipment, spare parts and technical knowledge to fight and win worldwide; and to succeed in a wide variety of operations other than war that the nation's leaders deem Army participation is in the national interest.

Over the past several years, TACOM provided logistical support for soldiers in Operations Just Cause (Panama), Desert Shield and Storm (Southwest Asia), Restore Hope (Somalia), Uphold Democracy (Haiti); and in disaster relief (Hurricane Andrew, Florida).

At this writing, TACOMers of a wide variety of professional disciplines, including logisticians and readiness personnel, using resources they can control worldwide, are hard at work ensuring the success of American field units involved with Bosnia. In addition to keeping the American fleet rolling in Bosnia, TACOM employees tailored the effort to overcome special weather and terrain issues and to provide enhanced countermine capability and ballistic protection.

Overall, TACOM manages and supports 1,156 Army reportable Line Item Numbers (LINs); and 40 percent of the readiness reportable LINs that TACOM's parent organization, the Army Materiel Command, is responsible to support.

Conclusion

TACOM traces its roots back to the pre-World War II day when President Franklin D. Roosevelt ordered a tank plant be built on the Detroit Arsenal and start producing tanks ASAP. The first tanks rolled off the lines long before construction crews finished building the walls.

The times and technologies have changed and will continue to change. For more than six decades there have been buildups, build downs, RIFs, reorganizations, boom times and bust. That old plant is going through the BRAC process and TACOM will have shrunk from some 12,000 people in 1990 to about 7,000 10 years later. But, there will be a TACOM, a strong-willed TACOM. And TACOMers will still proudly give the Army its commitment to excellence.

SINGLE PROCESS INITIATIVE AND THE ARMY

By BG Harry D. Gatanas
and Marilyn Harris Harpe

Introduction

The Single Process Initiative (SPI) is a key component of Department of Defense (DOD) acquisition reform initiatives. It is significant in that it is a primary means of helping DOD move toward performance-based contracting which allows industry to use best practices and commercial processes in lieu of military standards and specifications. The implementation of common processes at a contractor's facility requires the joint efforts of industry, the Defense Contract Management Command (DCMC), the Defense Contract Audit Agency (DCAA), program executive officers/program managers (PEO/PM), buying commands, and other Defense acquisition organizations that award contracts to industry.

With issuance of the "Perry Memo," on Specifications and Standards, dated June 29, 1994, the Department of Defense began to focus on specifications and standards reform as a major part of the acquisition reform initiatives. However, eliminating military specifications and standards and developing performance specifications, as well as other aspects of specifications and standards reform were all focused primarily on new acquisitions. The benefits of specs and standards reform could not be fully realized until action was taken to address the hundreds of existing contracts which still include provisions for compliance with military specs and standards, often with multiple, burdensome requirements for similar processes at each contractor facility.

A major problem with many existing contracts is that buying activities within the Services and other government agencies, have individually imposed different requirements for similar manufacturing and management processes. The result has been increased costs, burdens in contract management and administration, multiple, redundant, overlapping and/or non-value added requirements. The solution to this problem is to allow con-

The objective of the Single Process Initiative is to allow contractors to use best commercial practices and in so doing, eliminate multiple, redundant, and non-value added requirements.

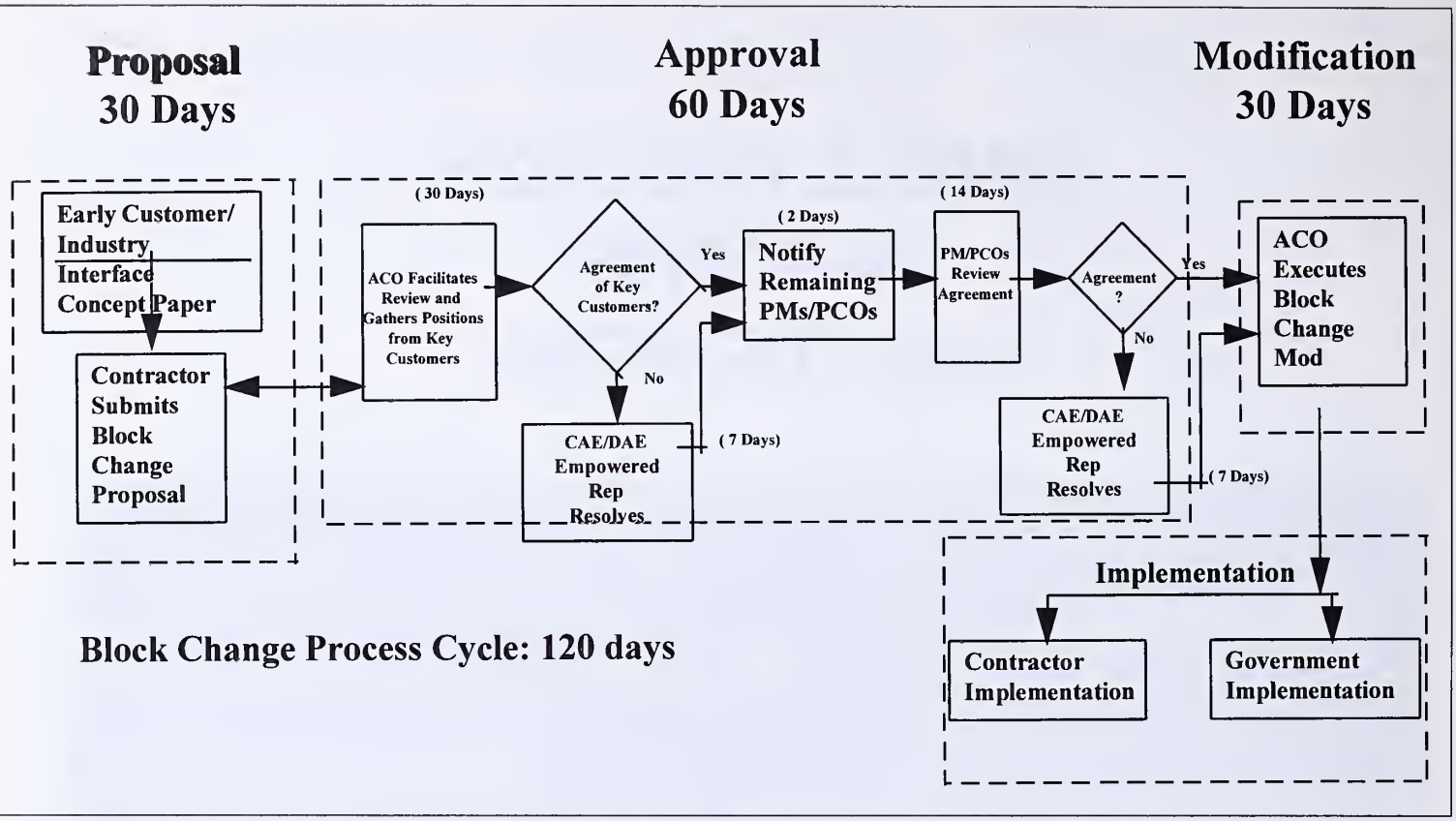

Figure 1.
The 120-day block change process.

tractors to adopt, on a facility-wide basis, common processes and commercial practices capable of meeting each customer's requirements. The objective of the Single Process Initiative is to allow contractors to use best commercial practices and in so doing, eliminate multiple, redundant, and non-value added requirements. The result will be reduced costs.

Block Change Process

On Dec. 6, 1995, the Secretary of Defense, Dr. William Perry, expanded his 1994 memorandum and directed that block changes to the management and manufacturing requirements of existing contracts be made on a facility-wide basis, to unify management and manufacturing requirements within a facility, wherever such changes are technically acceptable to the government. The Under Secretary of Defense for Acquisition and Technology was charged with issuing additional guidance necessary to replace government-unique requirements in existing contracts with uniform requirements within the contractor's facilities. This was followed by a memorandum on Dec. 8, 1995, by Under Secretary of Defense (Acquisition and Technology) (USD(A&T) Dr. Paul Kaminski. This memorandum directed the use of an expedited, streamlined approach to evaluating contractors' proposals for single processes. The memo generally defined the roles and responsibilities for the SPI and outlined a 120-day process for accomplishing block changes to existing contracts. It further gave the Defense Contract Management Command administrative contracting officers the authority to execute class modifications to implement these processes (see Figure 1).

Later in December 1995, the Assistant Secretary of the Army for Research, Development and Acquisition (ASA(RDA)) provided early implementing guidance for Army activities. It described the establishment and responsibilities of an Army component team leader tasked with coordinating the evaluation of contractor single process proposals and block changes with Army customers. The Deputy Assistant Secretary of the Army, Procurement (DASA(P)) was identified as the focal point for Army participation in the process.

In January 1996, the Army became proactively involved in the Single Process Initiative by moving forward to identify the Army's Top 30 program candidates to participate in this initiative (see Figure 2). Some of the 30 contractors were already involved in reinvention lab activities which provided them an even greater opportunity to participate in the SPI. With the identification of the Top 30 programs came the selection of Army points of contact (POCs) for each program or contractor. These POCs were charged to learn all they could about the Single Process Initiative and, in coordination with DCMC, interface with our industry partners to ensure that these significant Army contractors were informed and encouraged to participate in the SPI Program.

To jump start the Army's involvement in the initiative, DASA(P) Dr. Kenneth Oscar; BG Harry Gatanas, Assistant Deputy for Systems Management and Horizontal Technology Integration, Office of the ASA(RDA); and other key members of the DASA(P) staff embarked on an ambitious mission to visit as many of the top 30 contractors as possible. The purpose was to promote the Army's involvement in the program by meeting, personally, with government and industry officials at each facility.

SPI Implementation

Although the DCMC has been designated as the lead government facilitator in implementing plant-wide changes to common or single processes, without the active participation of the Services, the Single Process Initiative cannot move forward. The local DCMC plant or area office has primary responsibility for administering the SPI process at each contractor facility. The forum to accomplish this is through a Management Council. The primary role of the Management Council is to facilitate the receipt, evaluation and acceptance of concept

ORIGINAL ARMY SINGLE PROCESS INITIATIVE TOP 30 CONTRACTORS

CONTRACTOR	PROGRAM	ENGAGED IN PROGRAM	DESIGNATED POC
Raytheon	Patriot	Yes	A.Q. Oldacre/Bill Smart
United Defense	Bradley/Crusader/ Paladin	Yes	Charles Giufurta
General Dynamics Land Systems	Abrams	Yes	Prince Young
Sikorsky	Comanche/Blackhawk	Yes	Bud Bowersox
McDonnell Douglas Helicopter Systems	Apache/Apache Longbow	Yes	Bud Bowersox
Westinghouse	Apache Longbow	Yes	Billy Bentley
Boeing Helicopter	Comanche	Yes	Bud Bowersox
Lockheed-Martin	Hellfire/Javelin	Yes	Billy Bentley
Lockheed-Martin	Stingray/ASAS/C2V/Ammo	Yes	
Hughes Missile Systems	TOW	Yes	Billy Bentley
Texas Instruments	2d Gen Flir	Yes	Billy Bentley
Oshkosh Truck Corp	HET	Yes	
Loral Vought	ATACMS/MLRS/THAAD	Yes	Billy Bentley
ITT	SINCGARS	Yes	Eric Stern
Olin	Ammo	Yes	Walt Keller
Motorola	JSTARS/GBCS/SATCOM	Yes	Michael Ryan
United Technologies	MLRS/THAAD	Yes	Billy Bentley
Alliant Techsystems	Paladin/Ammo/ SADARM/Crusader	Yes	Charles Giufurta
Rockwell International	GPS	Yes	Eric Stern
Allied Signal	Blackhawk /Comanche	Yes	Bud Bowersox
TRW	BCIS/FAAD	Yes	Billy Bentley
GTE	Circuit/Message Switch	Yes	
GMC-Allison	Comanche Engine	Yes	Bud Bowersox
Harris Corporation	MILSTAR	Yes	Mike Ryscamp Alan Alper
Northrop-Grumman	BAT	Yes	Billy Bentley
Northrop-Grumman	IFTE	Yes	Mike Ryscamp Alan Alper
Textron Defense Sys	WAM	Yes	John A. Moore
GE	Blackhawk Engine	Yes	Bud Bowersox
Teledyne	Crusader	Yes	Charles Giufurta
GE	SATCOM	Yes	Eric Stern

Figure 2.

papers which describe common processes the contractor proposes to adopt on a facility-wide basis. The Management Council consists of an SPI Service component team leader, senior representatives from the local DCMC office, the DCAA office, the contractor and representatives from customer organizations that have active contracts at that facility.

The Army component team leader is a major player in the process. The appointment to the role of the SPI Army component team leader necessitates a strong management commitment to the implementation of acquisition reform initiatives in general, and to the success of the SPI in particular. The responsibilities assumed in this role—as a spokesperson for the Army—requires the nomination of an individual who is:

- a senior official empowered to serve the best interests of all Army customers in this process;
- willing and able to fulfill the commitment of time and effort to attend Management Council meetings and be directly involved in SPI activities; and
- committed to dedicating effort in coordinating SPI activities between all applicable Army customers. In practice, Army component team leaders have generally been senior PEO/PM management officials or senior management staff personnel from a buying command.

Conclusion

By all accounts, the Army's active participation in the Single Process Initiative makes good business sense. The Army can point to a number of SPI successes that have resulted in the reduction of multiple processes. The streamlined processes are evident in the Raytheon success stories which resulted in more than 884 contracts being changed with a single modification. The Army's share in the savings was $1.5 million which went back into the Patriot program. Another success story is with Texas Instruments where 20 processes have been modified. The United Defense Limited Partnership (UDLP) has modified 11 processes resulting in significant cost avoidance.

From a business perspective, the Army's interest in the SPI is to recognize it as a significant tool in the acquisition reform "toolbox" for saving money which can ultimately be used for reinvestment in modernization of processes. With these proven success stories and teamwork on the part of all involved, we can move the Single Process Initiative beyond acquisition reform to a new way of doing business. It is a win-win situation for both the government and contractors that we cannot afford to pass up.

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MARILYN HARRIS HARPE is the Army Single Process Initiative Program Coordinator. She is reponsible for development and implementation of all Army policy and guidance and is the Army's primary focal point for this initiative. A procurement analyst with the Office of the Deputy Assistant Secretary of the Army (Procurement), she received her undergraduate degree from the University of Missouri at Rolla and her master's degree from the University of Oklahoma.

VELOCITY MANAGEMENT AND THE ARMY ACQUISITION CORPS

A Symbiotic Relationship

By CPT Andrew C. Eger

Applying velocity management, the Army logistics community will measure its performance closely in order to continue to improve its support to the commanders in the field.

Background

On Jan. 20, 1995, then Deputy Chief of Staff for Logistics (DCSLOG) LTG Johnnie E. Wilson (now GEN and Commander, U.S. Army Materiel Command (AMC)) appointed MG Thomas W. Robison, then Commander, U.S. Army Combined Arms Support Command (CASCOM) (now retired), as the executive agent for velocity management (VM). MG Robert K. Guest is the current Commander of CASCOM and VM Executive Agent.

Velocity Management

Velocity management is how the Army is going to do its logistics business, both in garrison and when deployed. The aim is to get logistics support into the hands of the soldier as fast as any first-rate commercial firm, while providing a hedge against unforeseen interruptions in the logistics pipeline. Implementation of VM is going to assure outstanding performance by finding and eliminating sources of delay and undependability in the Army's logistic process.

Applying VM, the Army logistics community will measure its performance closely in order to continue to improve its support to the commanders in the field. Ultimately VM will result in reduced stockage real dollar savings as the Army replaces logistics mass with precision and speed. But the bottom-line goal is to improve the effectiveness of the logistics processes in sustaining mission accomplishment.

A consortium of the senior logistics generals in the Army, known as the Velocity Group (VG), meets quarterly to review and discuss VM progress, issue guidance and provide direction for further VM initiatives. Furthermore, GEN Ronald H. Griffith, Vice Chief of Staff of the Army, issued a message of Mar. 22, 1996, directing the implementation of velocity management at all installations.

The most recent VG meetings were held on Feb. 9, 1996, Aug. 5, 1996, and Dec. 5, 1996. Participants included GEN Wilson; LTG John G. Coburn, DCSLOG and former Deputy Commanding General, AMC; MG Robison; and MG Guest. The meetings graphically illustrated the need for Army Acquisition Corps (AAC) representation on the VG in order to provide feedback and direction to the AAC community regarding their critical role in the long-term success of VM. At the Dec. 5, 1996 VG meeting, LTG Coburn stated, "The VG meeting is the most important logistics meeting in the Army."

Process Improvement Teams

Currently, VM consists of four Process Improvement Teams. Each team has a Senior Executive Service leader. The teams and their leaders are:

- ***Order and Ship Time,*** headed by Tom Edwards, Deputy Commander, CASCOM;
- ***Stockage Determination,*** headed by David Mills, Office of the DCSLOG;
- ***Repair Cycle Time,*** headed by Wympy Pybus, Office of the DCSLOG; and
- ***Financial Processes,*** headed by Ernest Gregory, HQDA, Office of the Assistant Secretary of the Army (Financial Management and Comptroller).

The purpose of each team is to examine in detail the subprocesses for their respective areas. Obviously, each of the three major processes directly affect each other. For example, the stockage level for an item can directly impact the overall Order and Ship Time for a requisition which will directly effect the awaiting parts time segment for a work order. Obviously, the financial process effects everything. In turn, each of the four processes are heavily influenced by integrated logistic support (ILS) planning

and the provisioning process in a weapon system's life cycle development. During the VG meeting, LTG Coburn commented that "provisioning is broke," thereby underscoring that this process must be improved.

Examples

Examples abound where aggressive, sound, and in-depth ILS and provisioning planning served to significantly reduce the overall costs associated with extended life cycle maintenance. However, there are an equal number of examples, both very recent and extended, where the system did not adequately address ILS and provisioning issues. The result was increased costs attributed to maintenance and reduced weapon system availability.

The VM Repair Cycle Time Process Improvement Team, in conjunction with the RAND organization, is investigating several areas related to the repair cycle that could be directly improved through detailed planning throughout a weapon system's life cycle. A report from RAND—*Maturing Weapon Systems for Improved Availability at Lower Costs,* by John Dumond, Rick Eden, Douglas McIver, and Hyman Shulman, 1994—addresses the subject in detail. The document is available by calling RAND's distribution services at (310)451-7002.

Areas Addressed By Velocity Management

Obviously, thorough life cycle planning can influence numerous supportability areas. A few of the areas addressed by VM are listed below. The list is not all-inclusive and serves only to highlight several areas. The RAND report cited above includes a table, titled "Acquisition Process with Maturation Development," which lists additional areas to address in the acquisition process for both new and fielded weapon systems.

Fault Diagnostics. As our weapon systems become increasingly complex, the need for accurate and timely fault identification becomes more acute. Incorrect or slow fault identification causes increased stockage levels and extends the repair cycle time. Two actions that could increase fault diagnostic performance are:

- *The use of diagnostic test sets or "gold cards."* If a Line Replaceable Unit (LRU) or circuit card has a high "no evidence of failure" (NEOF) rate then the availability of a diagnostic replacement would eliminate the need to requisition the LRU/circuit card to see if it was, in fact, faulty. The RAND report indicates that the Apache helicopter has experienced NEOF rates as high as 30 percent for some LRUs. Or, if a fault in a particular LRU prevents testing subsequent LRUs, the availability of a diagnostic spare would facilitate requisitioning all of the faulty LRUs/circuit cards at once, instead of one at a time.
- *Increased use and development of base shop test sets such as the turbine engine diagnostic (TED) test set.* TED allows the repair facility to diagnose and identify numerous faulty components at one time. The design for a recently fielded system provided for external use of a diagnostic device. However, the device would have increased the overall system cost. Therefore, the PM elected not to include the diagnostic capability in the fielded system. The result is that soldiers in the field are using paper clips in an effort to connect the external diagnostic system. The weapon system is not available for a far greater amount of time as a result of this near-term, cost-saving measure.

While providing for diagnostic spares and base shop test sets in weapon system development may significantly increase a weapon system's initial cash outlay, they will provide far greater combined tangible savings (reduced inventories) and intangible savings (increased weapon system availability) over the entire useable life of the system.

Parts provisioning. Planning for parts provisioning includes many sub-areas and can directly affect VM performance through stockage levels, back order rates, and order ship times. While we generally do a favorable job in identifying the initial requirements for the parts explosion process and essentiality coding, the actual providing of those initial stocks is frequently lacking. Total package fielding should provide for availability of the necessary stocks. Furthermore, parts that are initially, and correctly, essentiality coded may not be an all-inclusive list throughout the life of the system.

We need to conduct periodic reviews of the essentiality codes for each weapon system based on actual demand data. One possible aid in data collection efforts relating to fielded system fault patterns and stockage levels is for each PM to establish an e-mail address to communicate with the field maintainers. This may be an off-shoot of the SMART program, but it will provide much quicker feedback to the PM and increased responsiveness to the field.

Increased contractor support. LTG Coburn stated that "we should have contractor provided support for the first two years of a new weapon system fielding." This would aid in identifying supportability issues, as well as help in training Army maintainers. However, the contractor-provided support contract must be carefully written. Perhaps the best example of a recent success story on contractor-provided support is the GTE contract for Mobile Subscriber Equipment. The GTE contract specifies strict performance standards, and does not provide for government-provided parts. As a result, GTE maintains its own floats and generally provides a repaired or replaced item in seven days or less. In contrast, a recent less successful contractor-provided support contract specifies only performance goals and all parts are government-provided equipment. There are no incentive or penalty clauses for meeting or not meeting the performance goal. The result is that the supported items are generally repaired in more than twice the time of the performance goal. Also, by providing government-furnished parts, we are directly linked to their repair cycle time.

Design for component replacement. Component replacement allows for increased use of diagnostic spares or gold cards. Furthermore, component replacement is generally much faster than repairing the component on the weapon system, which will increase weapon system availability. A further benefit of a component replacement design is that weapon system upgrades may be more easily implemented.

Conclusion

Just as the actions of each Process Improvement Team in the VM process affect each other, the actions of each PM affect VM. We can greatly influence and increase weapon system supportability functions by working together in a coordinated effort. Based on comments made by members of the Velocity Group at the meeting last February, I believe that direct AAC representation on the Velocity Group is essential. Such representation will provide direct feedback to the AAC community, instant response to AAC-related comments and questions, and improve perceptions of AAC performance.

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THE WORLD'S FIRST 21ST CENTURY TANK

By LTC George Patten and
MAJ Craig Langhauser

Introduction

An article titled, "The World's First Information Age Tank," published in the September-October 1996 issue of *Army RD&A* magazine, outlined the technical characteristics and the warfighting value of the embedded, digital weapon "system of systems" as embodied in the M1A2 tank. By all measures, including objective operational and technical tests and international competitions, the M1A2 is and will remain the world's premier direct fire, tactical weapon system through the turn of the century. The military value of the Abrams variant is that it delivers never-before-seen capabilities in fire control, navigation, diagnostics, vehicle controls and command, control and communications (C^3) to clearly overmatch all other armored systems. And, the M1A2 does so at a weapon cost comparable to other less sophisticated armored vehicles and much less than comparably sophisticated aircraft systems.

The purpose of this article is to outline the warfighting and investment values of the M1A2's System Enhancement Package (SEP) Program to the Army's warfighters and acquisition managers and to highlight the C^3 sub-system upon which the tank's capabilities as a sensor, as well as a shooter, depend. At completion, the enhanced M1A2 will lay the foundation for tomorrow's "system of sensors" that will enable 21st century warriors to move, acquire, shoot, and communicate on the digital battlefield. For that reason, as much as any other, the M1A2 with SEP should remain the Army's Force XXI land warfare centerpiece. Its weapon system technical architecture (WSTA) should be the benchmark for embedded acquisition/investment decisions.

System of Systems

The M1A2 now being fielded was built upon the "system of systems" concept. Founded upon the late 1980s version of the WSTA, which requires commonality, flexibility and modularity of digital hardware and software architectures (Figure 1); this concept enables each of the eight tank subsystems to be built as a separate system; yet optimize the collective tank system's performance. However, the full "system of systems" potential could not have been envisioned at that time. Thus, as the M1A2 matured through development in the early 90s, more and more performance was expected of it. The additional capabilities and functions exhausted available processing capability and memory and demonstrated the need to be able to integrate software applications and functions more easily. The Force XXI software is one set of those applications where functions need to be integrated. Although the basic digital architecture of the M1A2 is valid, as evaluated by both the Army's Tank-automotive and Armaments (TACOM) and Communications-Electronics Commands (CECOM), it needed to be modified to achieve Force XXI requirements.

Together, the requirements for adding faster processors, more memory and more modular software formed the basis for initiating the SEP Program so soon after completion of the M1A2 development program. The warfighting goal—to improve the M1A2's "own the night" capability—ensures interoperability with other Force XXI C^3 systems, and the ability to sustain the fight in very high temperature environments. The investment goal is to restore enough growth capacity that technological advancements applied through 2000 would not require significant reinvestment in hardware modifications and add no more than $1.4 million to the M1A2's production price. This is an aggressive goal given that the forward-looking infrared (FLIR) costs nearly $1 million.

Note: The SEP program is not an M1A2 upgrade, but a package of modifications to the baseline M1A2 to be introduced collectively into production in the third quarter of 1999, and then retrofitted to previously produced M1A2s beginning in 2002. The SEP includes: upgrade computer processors, add mass memory, change to color displays, incorporate advanced sights (Second Generation FLIR), introduce a new C^3 package (Force XXI command and control), and modify the architecture (Figure 2) to comply with the Common Operating Environment and Army Technical Architecture standards. After integrating a new FLIR in each sight, the predominant effort is software-driven. Major hardware changes concentrate on modifying four M1A2 multifunctional line replaceable units. The remainder of the M1A2 and the hardware architecture remains unchanged by SEP.

So what is this "system of sensors" the M1A2 seeks to be? The computer driven "system of systems" currently contains sensors that reside within each of the tank's eight sub-systems and generate data shared over the tank's data and utility buses or local area networks. These sensors include the fire control optics, navigational gyro, engine

control unit, and laser. As expected, the SEP sensors will generate and deliver more data, and the computers will rapidly generate and update data used both internal to the tank and external to other sensors and shooters and commanders in the wide area network.

Today, only a limited set of available data is used to create information for other subsystems and the crew. With the addition of key sensor technologies and the means to communicate the data, the M1A2 can fulfill its role as both a shooter (primary role) and a sensor (secondary role). This is a tremendous warfighter enhancement for the resources invested.

Tactical Internet

The most difficult technical challenge will be to mature the C^3 sub-system, the "tactical internet" comprised of C^2 message files/tables + modem/router + communications devices. Given that, the Army's primary emphasis has been on the tank's C^3 sub-system, IVIS (the inter-vehicular information system), which warfighters have declared the foundation of Army digitization and the Army's C^3 community has decried as limited in interoperability, performance, and growth capability. It was the Army's first—and remains the only—functional, real time, maneuver digital C^2. However, its capability was limited to the tank battalions with M1A2 and limited by the radio and modem/router portions of the "tactical internet."

The difficult task ahead for the Army will be the development of the complete end-to-end "tactical internet" necessary to communicate among various sensors, shooters, and commanders the vast array of digital information. In addition to prescribing the standard format for the data to be transmitted and received, the "tactical internet" must be able to establish a network, route the data properly in real time, and possess a large enough "pipeline" to move real time data.

Concurrent with M1A2 production, the Army funded the SEP Program to enhance the tank's digital WSTA and computer resources. Thus, it could integrate the emerging Army Technical C^3 Architecture (Figure 3) that attempts to define the "tactical internet." This effort will facilitate incorporating the tank's C^3 sub-system into the Army's Force XXI evolving "tactical internet" and enable digital data movement on a broad scale.

Advanced Technology Demos

Those technologies with the highest near term performance pay-off to transform the M1A2 into the "system of sensors" are currently being matured in the Target Acquisition (TA), Hit Avoidance (HA), and Crewman's Associate (CA) Advanced Technology Demonstration (ATD) programs. Within these ATDs, the Army is maturing multi-function lasers, laser warning receivers, and advanced integrated displays that provide the sensor interfaces (Figure 4).

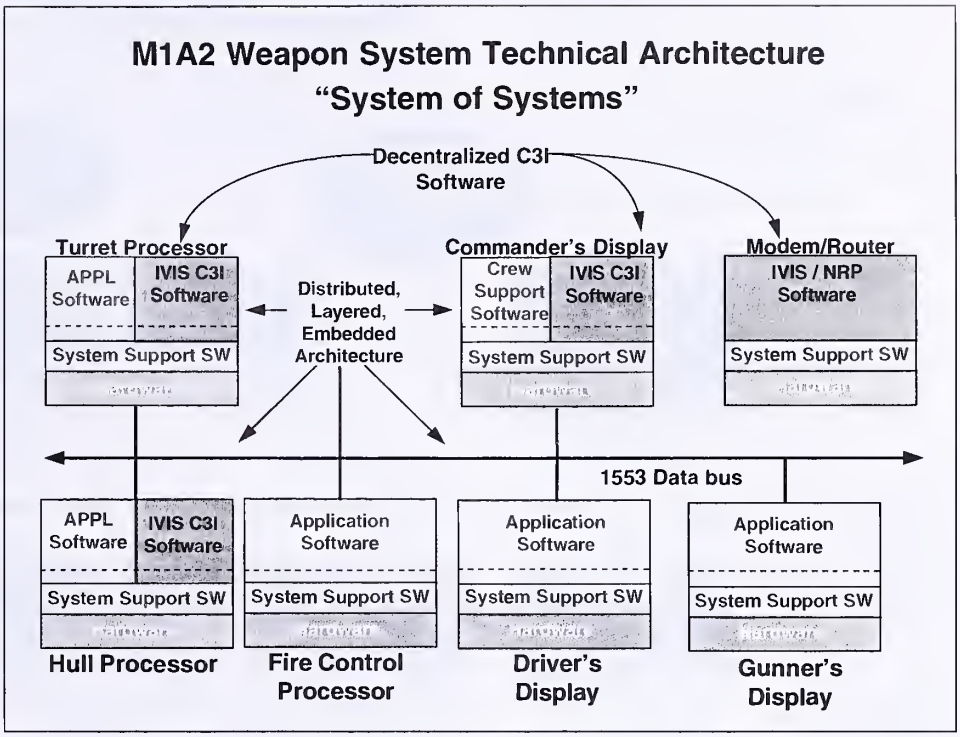

Figure 1.

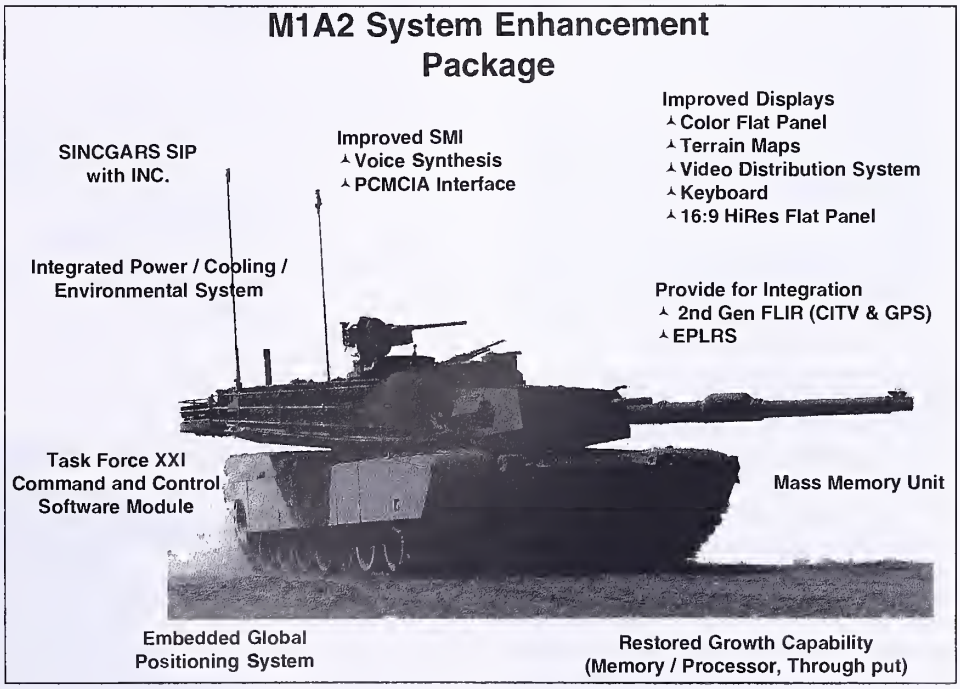

Figure 2.

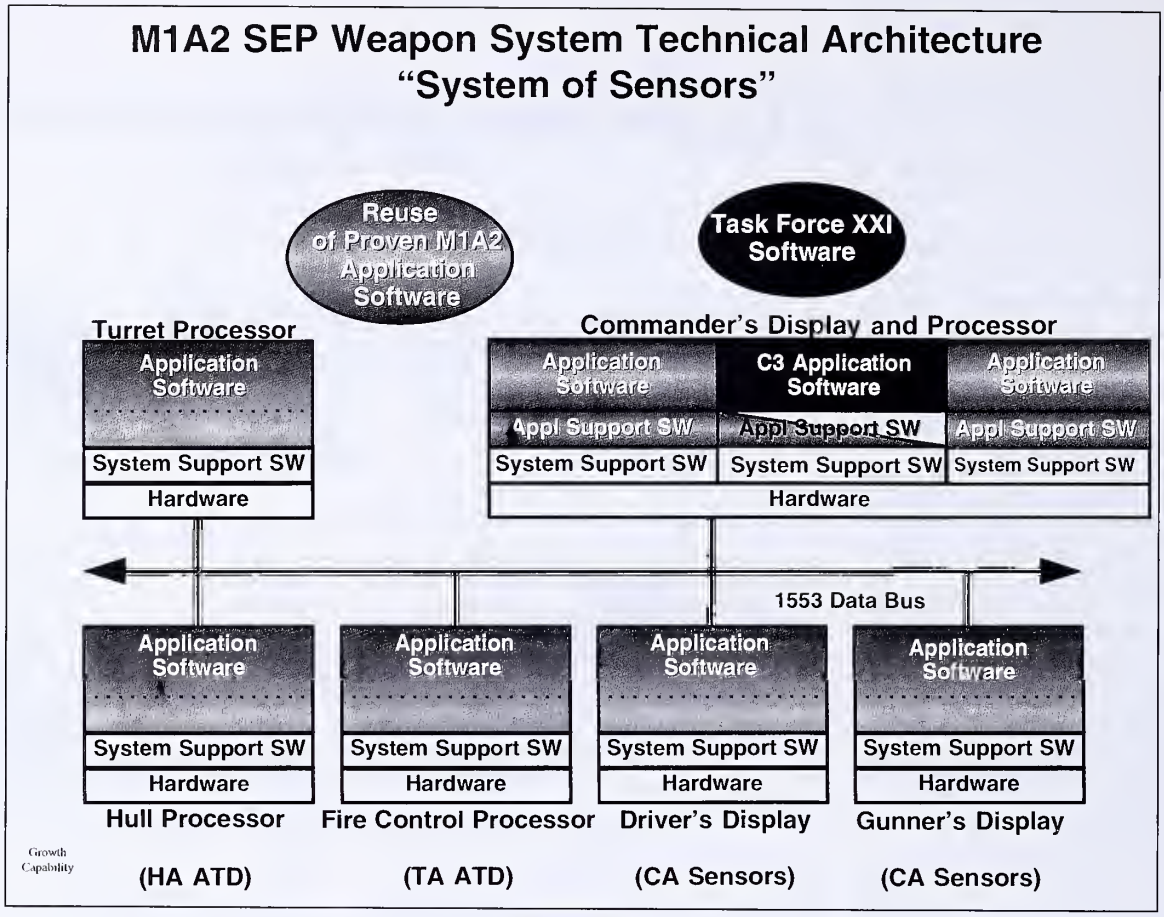

Figure 3.

By 2000, the TA ATD, should prove the viability and worth of new sensors and sensor fusion algorithms in the automated detection, identification and tracking of targets. The sensors currently being considered for the target acquisition suite include upgrades to the current GEN II FLIR; a multi-function laser device; and a millimeter wave radar (MMWR). The TA ATD will also develop algorithms that automate target acquisition functions, thereby reducing crew workload and speeding external information distribution to other vehicles or sensors.

The HA ATD will demonstrate an integrated Defense system which provides top attack/horizontal protection and situational awareness for ground combat vehicles. To achieve this, the ATD will develop a commander's decision aid to control electronic warfare sensors and countermeasures; demonstrate Active Protection System (APS) components such as active MMWR and missile-launched countermeasures; and develop electronic warfare suite emulators.

The CA ATD will design and demonstrate crewstation concepts that increase crew performance while decreasing their

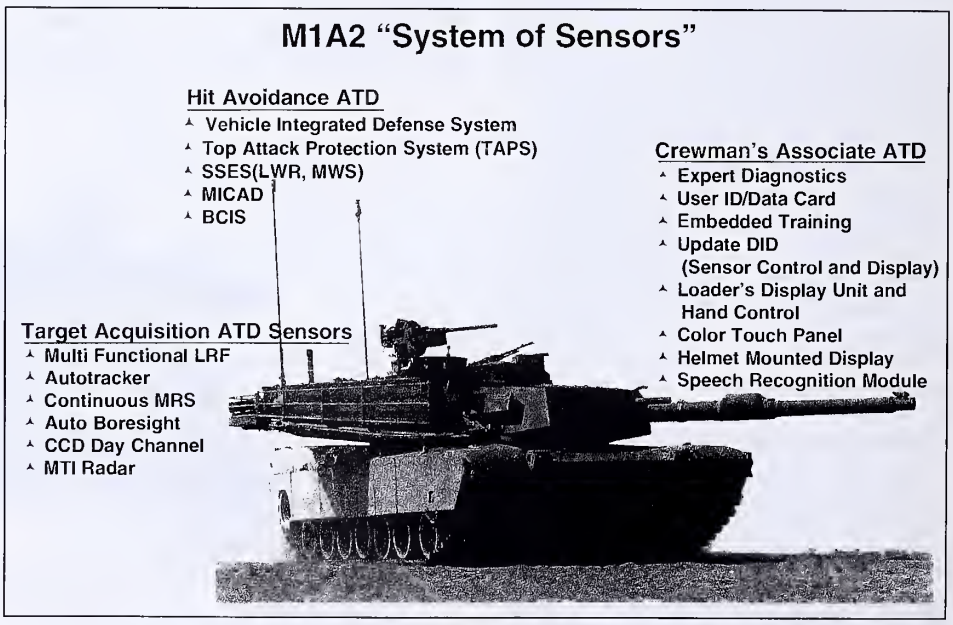

Figure 4.

workload even given the increasing array of sensor data sources and volume. This ATD focuses on using advanced soldier-machine-interface, automation, ergonomic environment design, and sensors to achieve this goal. The ATD will identify how the crew can handle the significant increase in battlefield data flow in Force XXI concepts that can overwhelm the soldier's ability to process the ever-increasing data, and degrade his ability to use his vehicle. In a "system of sensors" concept, this ATD becomes critical as the utility of sensor-generated data will continue to be limited if the crewman is required to do all the data manipulation and distribution. These ATD technologies could be integrated on an M1A2 SEP platform by 2006.

Impact On The Crew

Thus far, this article has only covered the technical aspects of an Abrams tank with advanced technologies. What does this all mean to the commander and the crewman in the field?

First of all, the current tank crew organization and duties of tank commander, gunner, loader, and driver could be redesigned to maximize the technological advances. With a compact autoloader loading ammunition at up to 14 rounds per minute and fitting in the "wasted space" of the gun's recoil path, the senior crewman—the tank commander—would move to the loader's position. His responsibilities would entail directing and maneuvering the tank to the battlefield and planning future maneuvers. The "master gunner" (occupying the traditional tank commander's position) would be responsible for overseeing the process of detecting, identifying and engaging targets. The master gunner working in tandem with the gunner, with no change in duties from his traditional role, would alternate responsibility for overseeing each target engagement. The driver, with tactical displays at his side, would be more of a pilot. He would navigate the tank by following operational graphics generated by the crew or externally by someone in the chain of command and using computer-based terrain analysis to choose routes and fighting positions.

Now, how would this crew fight on the digitized battlefield of the 21st century? Imagine yourself in a tank moving 50 kilometers per hour cross country. The other tanks in your platoon are over two kilometers away to your flanks. Since your tank carries ammunition capable of engaging targets out to eight kilometers in a beyond line-of-sight mode, your battlespace is a moving, 4 X 8-kilometer bubble (excluding the vertical dimension) with an extensive network of data sources in your area of interest. Scout elements are five kilometers ahead and in the sky 10 kilometers ahead are circling unmanned aerial vehicles (UAVs) continuing to distribute sensor data to weapon systems within its radio range.

The UAV's sensor-generated video is broadcast into your tank. The video has an intelligence overlay from the task force (TF) intelligence officer. He indicates that the UAV has found the lead combat recon patrol of the advancing enemy. Based on this timely information, the task force commander issues fragmentary orders changing the TF's axis of advance. The order rapidly moves to your tank. Your platoon is to move into position to block the enemy's advance while the rest of the battalion maneuvers to a flank, all of which, the crew observes on their displays automatically. Your tank is right on the enemy's expected route of march. The tank commander directs the master gunner to find a good fighting position .5 kilometers ahead.

Once stationary, the master gunner and gunner work on establishing their engagement area. The digital map shows dead space that cannot be engaged with a line-of-sight munitions. Map overlay and sensor sector scan image data are exchanged within the platoon. The tanks adjust their positions to reduce dead space in the platoon's sector. The platoon leader assembles the finalized platoon fighting position, adds target reference points to cover the platoon's dead space, and forwards the data to the TF Tactical Operations Center (TOC). The data received by the TOC are also available to various other sensors, weapons, and commanders over the tactical internet, allowing optimal "task allocation."

The enemy is now six kilometers from your position. The tank using its FLIRs, laser radar, and MMWR scan your sector and detect potential targets. The tank switches from sector scan to target scan mode and proceeds to start target identification processing. The tank not only uses its onboard digital data but gets data from the flank tanks to build stereoptic target profiles. The tank establishes a target queue for the master gunner and the gunner to fight the tank to target battle. As this occurs the APS detects a laser beam projected on the turret. The APS warns the crew via audio cues, pops smoke in the quadrant with the laser threat, and paints a laser spot 50 feet in front of the tank. The threat laser beam riding munition impacts the ground in front of the tank. The tank commander monitors the engagement reports generated by the tank and okays them for forwarding to the platoon leader, tracks the rest of the company/team's movement, and works on his own maneuver plan. The driver monitors engagement progress, switches his tactical map to terrain analysis mode to search and plan supplementary and alternate fighting positions. Meanwhile, in the TOC...

Enabling acquisition managers to leverage new commercial technologies into embedded weapon systems clearly enhances and optimizes combat power.

Conclusion

Through this article and the previous one, which was published in the November-December 1996 issue of Army RD&A, we have attempted to outline the synergistic warfighting benefits of the embedded, distributed, computer-based M1A2 Abrams architecture. Enabling acquisition managers to leverage new commercial technologies into embedded weapon systems clearly enhances and optimizes combat power. With the improvements to computing power, memory, and color displays undertaken in the SEP, the M1A2 architecture remains the backbone of the tank and the Army's embedded weapon system fleet; possessing the needed capacity and versatility for the foreseeable future at an affordable cost.

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THE MAINTENANCE AND REPAIR SUPPORT SYSTEM

A Body-Conformal Information Support System

By Dr. Li Pi Su
and Charles Bosco

Introduction

Modern weapon systems continue to be more and more dependent on rapidly-developing technological advances and, thus, have become more and more dependent on computer control and information processing. Maintenance technicians use computers for diagnostics and repair information, but the computer is bulky and requires clean hands that are free to use a keyboard or mouse. In order to allow maintenance technicians to work unencumbered by their computer, the concept of a multimedia, wearable personal computer (PC), voice controlled, was envisioned to free computer users' hands. Over the past few years, a number of different companies have addressed this requirement with some success.

The Maintenance and Repair Support System (MARSS), currently under research and development, has been designed using a top-down design methodology based on an integration of the soldier's needs. It is an attempt to have the system conform to the soldier's needs, rather than having the soldier conform to the system, which requires more training. The Defense Advanced Research Projects Agency (DARPA) has coined the phrase "humionics" to describe this process. Because of this integrated design process, MARSS will not only meet the Army's future sustainment requirements—such as test, fault isolation, repair procedures, etc.—but will also be capable of voice command, multimedia, and remote information access.

Components

The MARSS system concept is to develop an open-architecture hardware and software system housed in a body-conformal maintenance aid. Because it uses a commercially available PC central processing unit (CPU), it will be compatible with existing software. The MARSS is an integrated system that consists of hardware components and system interface software. The five hardware components are:

- Head-mounted audio/visual subsystem;
- Central processor motherboard;
- Flat, flexible, and interchangeable battery pack;
- High-density, removable modular personal computer memory card international association (PCMCIA) disks; and
- Radio frequency (RF) communications devices.

Except for the audio/visual subsystem headset, the components are distributed two-dimensionally throughout an assault-type vest.

The system interface software consists of DOS- or Windows-compatible software. These include Windows Operating System, the user/weapon system interface software, the Integrated Diagnostics and Repair Information System (IDRIS) to coordinate all MARSS functions, associated peripheral drivers for wireless local area network (LAN), and VoiceLAN software for voice communications across wireless LANs.

The headset is the input and output device to the system and consists of a head-mounted microphone, speaker, and a small flat-panel electroluminescence display developed by Honeywell Inc. under a DARPA program.

The central processor motherboard consists of a Pentium-based, high-speed, upgradeable, very low power CPU, a peripheral component interconnect bus architecture for enhanced performance, a 16- to 128-megabyte RAM memory, and an internal hard drive.

The interchangeable battery package is an 11.4 volt flat, flexible, nickel metal hydride lithium dry cell battery that has a nine amp-hour capacity (six hours of operation without recharge, 1000 cycle life). A mobile Triton chipset is packaged in the motherboard to dynamically manage power consumption and effectively allow performing multiple system operational states.

There are six credit card-sized PCMCIA slots that accept modular PCMCIA disks which contain various instrumentation and databases.

The RF communications devices are commercial off-the-shelf (COTS) hardware with controlling software to provide a 900 megahertz operating frequency and a one-megabit-per-second data transfer rate allowing ultra-fast data acquisition. Communications are available between several MARSS users and between the MARSS user and the weapon system. Test data from a MIL-STD-1553 bus can be remotely accessed and retransmitted to the users.

The system interface software, IDRIS, is an open-architecture, system-interface software. It was developed by the Advanced Technology Office (ATO), the U.S. Army Test, Measurement, and Diagnostic Equipment Activity (USATA), U.S. Army Missile Command (MICOM), in December 1994, and was reported on in the August 1995 AUTOTESTCON proceeding. The IDRIS controls input and output devices, and six PCMCIA plug-in cards, including instrumentation, interactive electronics technical manuals, logistics, command, control, com-

munication and information, application data, and user data bases. The IDRIS requires very minimal training and can be very easily updated.

Technical Challenges

The MARSS concept is an integrated, body-conformal information support system for multipurpose use as an interoperable platform for mobile operations. It will assist soldiers, both trained and untrained, to reduce maintenance time and to increase operational readiness. To accomplish this, MARSS must be lightweight, body-conformable and comfortable. Many new concepts and technologies have been developed and investigated during the MARSS development. Extensive trade-off analyses were performed to determine the optimal designs and technologies. These included the following critical elements of MARSS: motherboard, electrical design, thermal management, batteries and energy management, vest design, wireless communications, software interface system, VoiceLAN, and system and ergonomic packaging.

The MARSS design requirements meet or exceed those of the Army standard test equipment and MARSS will perform at many levels of the support infrastructure, i.e., maintenance, logistics, command, control, communication, intelligence, medical, and special operations. Since MARSS is very portable, it can be operated at field sites, depots, and within theater operations.

Benefits

The MARSS total weight is about 11.5 pounds and its volume is about 148 cubic inches comfortably integrated with the user's body. The IDRIS controls multimedia repair/replace instructions. Hands-free operation will reduce the mean-time-to-repair and training costs, resulting in increased accuracy of maintenance and operational readiness. The wireless LAN and VoiceLAN frees the soldier from the unit under repair and provides interaction with other maintenance team members and the logistic database. The wireless LAN and VoiceLAN, with a global positioning system PCMCIA card, will allow soldiers to track their position and accurately locate weapon systems in need of repair.The open architecture of the system makes MARSS versatile, cost-effectively upgradeable in both hardware and software, and reduces life cycle costs. The high energy density lithium dry cell battery has a long operational life, is environmentally safe, and does not pose a hazard.

Teammates and Responsibilities

The MARSS concept was initiated by the ATO, USATA, MICOM and funded by the Army's Logistics Integration Agency. The current full-scale program is funded by DARPA. The U.S.Army Soldier Systems Command (SSCOM) is the program manager of the DARPA contract with McDonnell Douglas Aerospace Company-Huntsville, AL, the prime contractor responsible for system design and integration. The SSCOM also provides vest design, human engineering and DARPA liaison. The ATO provides technical management and IDRIS development. The ATO is also responsible for the MARSS technology insertion for maintenance. Honeywell Inc. is developing the headset under another DARPA contract.

The Maintenance and Repair Support System.

Applications

The MARSS has been specifically designed for use by military maintenance personnel; however, it has the analogous application for any commercial maintenance purposes, such as commercial aircraft. Moreover, the core of MARSS is a powerful, small-volume PC comfortably integrated into a vest. With the proper system interface software, MARSS can contain medical information and be used as a portable medical aid for emergency medical situations. The MARSS can also be used to integrate and display data from diverse and distributed databases to provide a real-time aggregated display for decision making. A digitized terrain capability is one possible application for operational commanders.

Conclusion

Consisting of a 486 computer with flexible board packaging, MARSS is the first integration of soldier and machine optimized for maintenance. This initial effort was supported by the Army's Logistics Integration Agency. The following are significant events for the MARSS program:

- Successful completion and testing of the first MARSS prototype in November 1995.
- Critical design review in February 1996, which MARSS passed, exceeding many of the targeted requirements.
- Participation in the battlelab warfighting experiment during the spring of 1996.
- A MARSS demonstration as a feature exhibition in the Continuous Acquisition Lifecycle Support Expo, Oct. 28-31, 1996.
- Adoption of MARSS by the Special Operation Forces to meet an information and communication requirement.
- Investigation by McDonnell Douglas Aerospace Company-Huntsville of F/A-18, C-17 and commercial aircraft applications for MARSS.
- An advanced MARSS prototype, summer 1996.

In conclusion, a body-conformal information support system concept has been successfully demonstrated and every indication is that the MARSS will be very beneficial for both military and commercial applications.

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JANUARY 1, 2000 IS A SATURDAY WHAT WILL YOU BE DOING?

By MAJ Ronald L. Spear

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Introduction

Digital technology is an integral part of our society. This technology finds itself embedded in systems that were previously manual or mechanical. The digitization of information presents a problem that not only lurks in our future but is here now. As we approach the next century, the problem's presence and pervasiveness will become increasingly clear and devastating. Not only do our systems depend on digital technology, but they depend on each other. Their interdependence adds an extra dimension of complexity. The problem is "00."

What am I talking about, you ask? In less than 38 months, the IT industry will experience its first **change in century** since it began. However, there is a slight problem plaguing the industry. This problem has several different names—Year 2000 Problem, Y2K Problem, Faulty Data Logic, Millennium Crisis, Century Date Change, Year 2000 Date Change, Century Dilemma, Year 2000 Challenge, and others. The problem is our computers were not designed to accept the year as "00."

The Problem

During more austere times in IT's fledging years, IT managers and developers made business decisions influenced by memory cost, system efficiency, and system life expectancy. Memory was expensive, processor speeds were slow, and most systems usually well exceeded their life expectancy. One result of these early decisions was a shortened date representation—using a two-digit **year in century** instead of four digits, as in 96 vs. 1996.

This is not the only problem encountered as we move into the next century. Many systems have faulty logic for determining **leap years**. The National Institute of Standards and Technology (NIST) explains, "Century years (like 1900 and 2000) are only considered leap years if they are evenly divisible by 400. Therefore, 1700, 1800, and 1900 were not leap years, but the year 2000 will be a leap year."

The actual length of a year is 365.242 days, not 365 days. That is why an extra day is added to the calendar on Feb. 29 on years evenly divisible by four. However, adding this extra day every four years results in about three extra days being added over a period of 400 years. That is why only one out of every four century years is considered a leap year. Simple, isn't it?—well, not so simple for computer systems.

The Effect

Now that you understand the problem, let's look at the impact. Sequencing of dates, date arithmetic, leap year identification, and date logic are all affected. Just to add another problem, many systems use the digits "99" or "00" as a special system flag—indicating "end-of-file" or "no-expiration" among other uses.

In addition, some hardware and operating systems do not roll over correctly from 1999 to 2000. Now that brings to mind an enormous number of examples from these few simple effects. Sequencing of dates in the years 1996, 1997, 1998, 1999, 2000 may result in a 00, 96, 97, 98, 99 date order. Any system that keeps track of inventories by expiration date may already be feeling the effects of the Year 2000 problem. Items in current inventory having expiration dates in the year 2000 and later are being shipped out **before** items expiring in years prior to the year 2000.

Date arithmetic that calculates a person's age is one of the most common date operations. Consider your age in the year 1999. If you were born in 1967, then in 1999, your age calculation would be 1999 minus 1967, resulting in your age calculated at 32 years old. However, in the year 2000, a system only using the **year in century** would calculate your age at -67, 00 minus 67. If the system didn't keep track of the minus sign, you could, conceivably, jump from being 32 years old to 67. Imagine at age 33 having the Social Security Administration (SSA) issuing you retirement checks thinking you are 67 years old. Rest assured, the SSA is just one of the agencies addressing the issue so such errors do not occur.

The Washington Post published an example of a computer system using 31/12/99 to represent the "close date" for British court cases which were delayed indefinitely for various reasons. The British court system is trying to prevent thousands of these cases from suddenly appearing on court schedules.

A Simple Test To See The Effect

You can perform a simple test on your PC. Just change the clock to 11:59 p.m. on Dec. 31, 1999. Now, let the clock run into next year—the next century. If you have an Intel-based PC and have not powered down your PC, your clock probably shows the time you would expect and the date would display as Jan. 1, 2000. Now power down your PC and power it back up. Check the clock now—it will likely display a correct hour of the day, just as you would expect, but the date most often displayed is May 1, 1980, not Jan. 1, 2000.

To see another date-related effect for a Windows application, perform the same test. Wait until the date rolls over to the year 2000. Now, power down your PC and restart it. Create a file with notepad and save it. Now open File Manager (or Explorer if you use Windows '95) and look at the details for the file you just created. You will most likely find the date stamp is 1/1/:0, instead of the 1/1/00 you might expect.

The list of effects of the Year 2000 on the IT industry go on and on. Additionally, the effects are not limited to only software but they extend to hardware, firmware, embedded systems, and operating systems. Adverse effects are not limited to any one platform, programming language, data base, or application. **Effects are occurring today** for systems that work more than four years into the future. As we approach the year 2000, expect to see a continually increasing number of effects. The problem is pervasive throughout the industry and every system **is** suspect.

Industry Perspective

Industry experts say, that this is not a technological problem, it's a management problem. The problem exists, and **fixing** it is **technologically** simple: the management and testing of the solution is complex. Experience shows that most of the solution effort rests in the management and planning of the solution and testing of the affected system(s)—40 percent planning for the solution and 50 percent testing. The actual system modification effort is only 10 percent of the entire effort!

Getting top-level sponsorship is a must. This sponsorship is often difficult to obtain, since normal business drivers are not present. It is difficult for senior-level management to understand that they need to devote precious resources and dollars toward a potentially very expensive solution that yields no increased capability for the company! Addressing the problem, however, ensures that the business can operate and function at the same level after moving into the year 2000.

The Gartner Group (a research, analysis, advisory, and strategic planning service provider) predicts less than half the IT companies will be Year 2000 compliant before the year 2000. Further, they forecast the solution cost for the IT industry as a whole will be in the range of $400 to $600 billion. This figure does not include the cost of litigation involving the Year 2000 problem and costs of companies who go out of business due to the problem. The legal community has recently estimated the cost of Year 2000 related litigation at $1 trillion.

The Office of Management and Budget (OMB) estimates the cost to solve the problem within government is near $30 billion. Estimates for the Department of Defense alone are near $13 billion. For planning purposes, industry is saying the cost is $1 per executable line of code (ExLOC) for a solution. However, plan on these prices increasing significantly as the Year 2000 approaches. The demand for assistance in addressing the Year 2000 problem is expected to far exceed the available supply of companies fixing Year 2000 problems.

In considering the pervasiveness of the problem, IBM estimates that 70 to 90 percent of customer application programs are affected. Of these programs, 4 to 6 percent of the LOC are affected. The New York Transit Authority provided an experience report at a recent Year 2000 conference indicating that 80 percent of their modules were affected and 1 percent of the LOC required modification. At the same conference, two insurance companies said that between 5 to 11 percent of their LOC required modification.

Let George Do It

At first glance, many people think they have no need to worry about the Year 2000 problem. After all, the IT industry professionals are smart people who will devise a plug and play solution for everyone. True, tools do exist that can assist in the solution and reduce the overall effort required. A majority of these tools are targeted toward mainframe platforms and the COBOL programming language. There is, however, no "silver bullet."

Finally, many believe that the modifications required to move systems into Year 2000 compliance can be accomplished during routine scheduled maintenance. In general, normal maintenance is just that—normal. The resources obligated for maintenance do not include additional resources for the Year 2000 solution. As noted earlier, the costly portion of the solution is not the actual system modification but the management and testing effort. One reason these efforts are so costly is the ripple effect caused by a Year 2000 solution.

Most systems have an application program interface (API) used to communicate with other systems. If an affected system's API includes a date with the year, then modification of that system will change its API. As a result, each system using that API must now be modified to accept and use the changes. Since the solution for one system affects all systems it interfaces with, the scheduling of the change to the Year 2000 compliant system must be coordinated with all systems it interfaces with. Bridges may be necessary for interfaces to systems that are not prepared to accept and use the compliant API.

What Is The Answer?

Developers, maintainers, and programmers, get started yesterday! Get senior-level support for the solution right at the start. Begin an awareness campaign within your organization. Dedicate a team of individuals to work the project. The group needs to maintain a good communications channel with the Year 2000 team at the next higher echelon. Team composition should include individuals knowledgeable in data standards, Year 2000 tools, quality assurance, data administration, configuration management, security, testing, validation, risk management, audit procedures, and legal issues.

Update your system inventory and conduct an impact analysis. Develop your strategy based on this analysis and your prioritization efforts. During your strategizing and prioritizing, consider the possible solution approaches. A long-term solution, as well as the solution most preferred, is to modify the data to include a four digit year. A short-term solution is logic modifications that determine the century with no data modification. The third solution—retire or rewrite the system.

With your strategy in hand, select a pilot project to validate your strategy. Now you are ready to perform the necessary system modifications to move your system into compliance. Thoroughly test your system for Year 2000 compliance. And yes, don't forget regression testing also.

Finally, don't leave home without a detailed risk management plan. There is great risk for organizations addressing the Year 2000 problem. Develop contingency plans based on these risks. Additionally, establish trigger dates for determining whether your contingency plan needs execution. There is risk in your prioritization and strategy selection that you must not overlook.

Historically, software projects come in late and over budget. Although past performance is no guarantee and cannot predict future performance, it certainly is a good indicator. Consider one of your core systems that has a Year 2000 problem with a date horizon (the date you expect the system to experience problems) yet it is a legacy system. You know that you have a replacement system that is Year 2000 compliant and is scheduled to be completed and installed in 1999. Considering the cost of fixing the legacy system, you decide that there is no need to expend constrained resources here since the system is being replaced. What is your level of risk? High? Do you have a viable contingency plan in case the replacement system does not make it in time? When must you decide to execute your contingency so there is sufficient time to complete it?

By the way, if you are a developer or acquisition manager, ensure new developments are Year 2000 compliant and Year 2000 compliance language is included in all system contracts.

Army Action Plan

The Army's approach to addressing the change of century problem is contained in the Project Change of Century (PCC) Actions Plan, Revision I. It details a centralized management with decentralized execution approach. The Army's corporate strategy and management approach for addressing the Year 2000 problem is defined. It provides a framework and guidance for Army organizations. A Year 2000 five-phase resolution process is adopted with this PCC revision. The five phases are: Awareness; Assessment; Renovation; Validation; and Implementation.

An aggressive phase time schedule is outlined with some portions overlapping. Finally, it provides reporting mechanisms to Army and ASD(C3I) on the scope and impact of Year 2000 compliance.

Remember that the 80 percent solution **on time** will likely be better than the 100 percent solution late. This deadline cannot slip!

The weekend of Jan 1, 2000, is less than 164 weeks away—that is less than 38 months! Don't make any plans yet for your New Year's Day festivities, especially if you are in the Information Technology (IT) industry! As one of the essential personnel in your organization, you may be called into work.

Oh, by the way, have a nice weekend!

MAJ RONALD L. SPEAR is the Army Year 2000 Project Manager in the Office of the Director of Information Systems for Command, Control, Communications and Computers, Information Integration and Analysis Center at the Pentagon. He holds a B.A. degree in computer science and mathematics from Concordia College, and an M.S. in computer science from the Naval Postgraduate School.

TEST AND EVALUATION ON THE MOVE

By COL Brent Crabtree

Army Test and Evaluation (T&E) is on the move. Partners in acquisition reform, T&E will operate at a reduced funding level, will integrate developmental and operational T&E activities, and seek to provide better customer support. (See Figure 1.)

More T&E Streamlining Needed

In recent years, Army T&E has come to depend more on smaller tests, combined developmental and operational testing, and testing in conjunction with training. However, the Army can no longer afford reductions in RD&A without reducing the supporting T&E infrastructure.

Traditional T&E began with developmental testing performed principally by the Test and Evaluation Command (TECOM). Results from developmental testing were evaluated by the developmental evaluators, the Army Materiel Systems Analysis Agency (AMSAA) or by TECOM assessors. At the conclusion of developmental T&E, programs faced a new team of testers from the Operational Test and Experimentation Command (TEXCOM) and a new team of evaluators from the Operational Evaluation Command (OEC). Some program managers (PMs) encountered two testers and two evaluators on the way to successful fielding of Army systems.

Future Army T&E efforts will be—must be—more resourceful. In the latest build of Army programs, $150 million was cut from T&E infrastructure and $460 million from PM funding for T&E. Consequently, there have been significant reductions to T&E infrastructure and changes to T&E policy.

T&E Restructuring

- **Two testers.** To comply with congressional and OSD guidance, the Army decided to maintain a separate, independent operational test activity. With headquarters in Northern Virginia, the Operational Test and Evaluation Command (OPTEC) will retain its operational test mission. TECOM, headquartered in Aberdeen Proving Ground (APG), will continue to operate ranges and perform the developmental test mission. Both commands will be further downsized over the next two years and

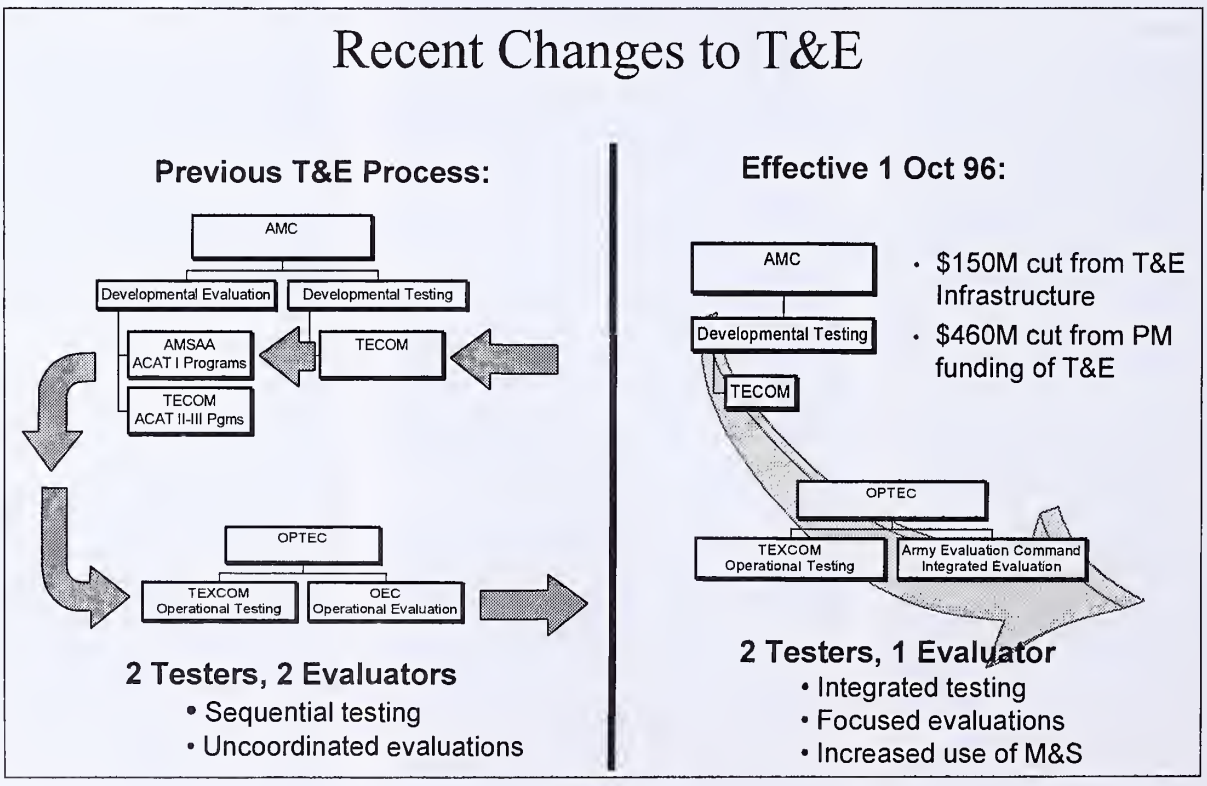

Figure 1.

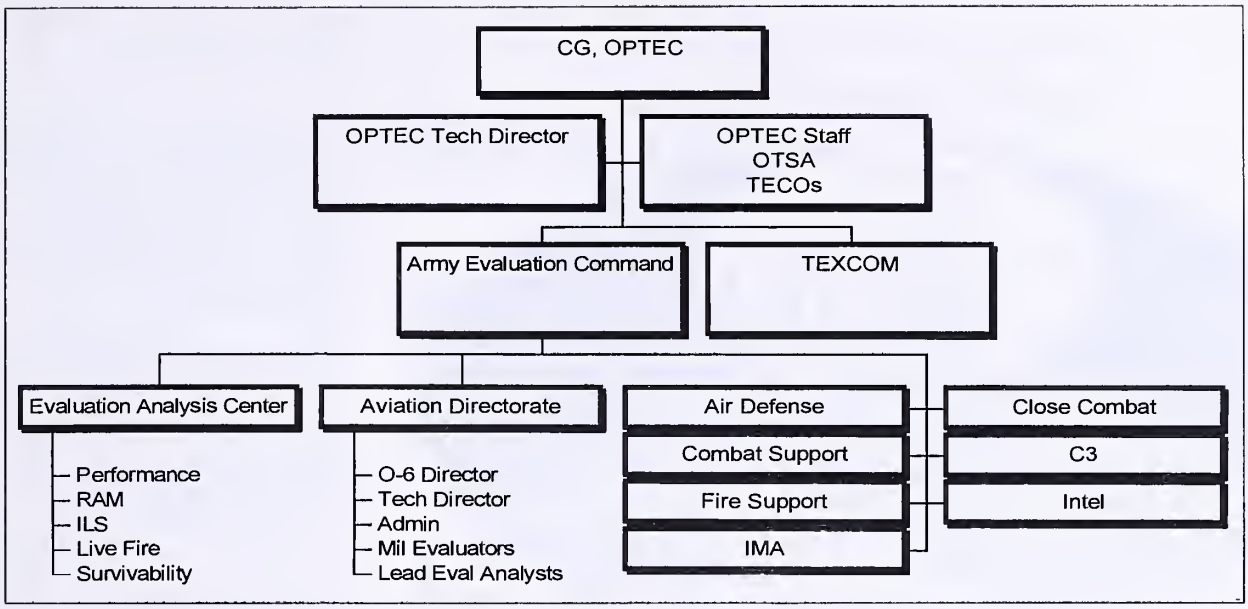

Figure 2.

will expand their efforts to work together in support of Army programs with substantially smaller test organizations.

• **One Evaluator.** On June 12, 1996, the Vice Chief of Staff, Army directed the transfer of the developmental evaluation mission and resources from the Army Materiel Command (AMC) to OPTEC. One hundred seventy evaluation jobs in AMSAA, TECOM and the Army Research Laboratory (ARL) were affected by the transfer which took place on Oct. 1, 1996. Over the next two years, OPTEC will further reduce its evaluation organization by approximately 60 spaces, saving the Army about $6 million per year.

New T&E Policy

The Army will integrate developmental and operational T&E, seeking to further eliminate redundancies and to keep the T&E strategy focused on operational requirements. There will be increased emphasis on the use of modeling and simulation (M&S) to reduce or enhance testing when cost-savings can be realized. To certify systems ready for operational testing, PMs may combine testing where possible and exploit all sources of data including contractor testing and M&S. While operational testing is still required to proceed beyond low rate initial production, the T&E community is committed to using all sources of credible data to evaluate system effectiveness, suitability, and survivability.

To develop plans for this reorganization of the evaluation mission, OPTEC consulted with a Senior Advisory Panel of distinguished Acquisition Corps experts with extensive experience in developmental and operational evaluations. The senior advisors provided an independent, unbiased review of the plans for consolidation of evaluation. They advised the Army to design an organization that anticipates change, to clearly define the mission and required AMC support, and to conduct a bottom-up review of the requirements.

From that review, an OPTEC-led task force found that the evaluation mission could be performed adequately if consolidated under a single command. With efficiencies created through consolidation, less duplication of effort, and more focused T&E strategies, OPTEC can achieve a 60-space reduction in the evaluation workforce over the next two years. (See Figure 2.)

The objective organization to be achieved by FY 99 is modeled after the successful 1992 consolidation of all operational testers into TEXCOM. All of the Army's developmental and operational evaluators will be consolidated into a single evaluation command, the Army Evaluation Command (AEC). Commanded by a brigadier general responsible for integration of all Army evaluation activity, the AEC will have battlefield-focused evaluation directorates with matrix support provided by the functionally-focused Evaluation Analysis Center (EAC).

Single Evaluation Team

Key to the successful consolidation of evaluation will be the formation of a single evaluation team for all Army systems. This one team will synchronize the developmental and operational T&E efforts to produce a single Army evaluation. A military evaluator and a civilian lead evaluation analyst will be assigned to the evaluation directorate for each evaluated system. These two people will be responsible to focus and coordinate the evaluation effort for the system. Other evaluation area specialists will also serve on the team in direct support or general support roles as needed.

Evaluation Analysis Center

The EAC will provide the evaluation area specialists who will assist the evaluation team in the conduct of continuous, independent, integrated evaluation. The majority of the EAC personnel came from AMC and will continue to live and work at APG. No personnel moves are planned. The EAC will be reduced from about 150 to about 130 people through normal attrition.

A Not-So-New Home

An empty barracks building at APG has been selected for renovation and will be the new home of the EAC. The renovation is scheduled for completion by February 1997. Until then, the former AMC employees will stay in place. Five people, formerly in the Survivability, Lethality Analysis Directorate (SLAD) of ARL will remain at White Sands Missile Range (WSMR) to coordinate evaluation support from ARL elements at WSMR. Similarly, one former SLAD employee will stay at Fort Monmouth to serve as liaison with ARL elements at that location.

Worldwide Notification

OPTEC released a world-wide message on Oct. 1, 1996, announcing the assumption of evaluation responsibilities. OPTEC will take other actions to communicate the effect this reorganization will have on Army acquisition. Among the most prominent of actions, OPTEC will coordinate revisions to Army regulations, provide brief-

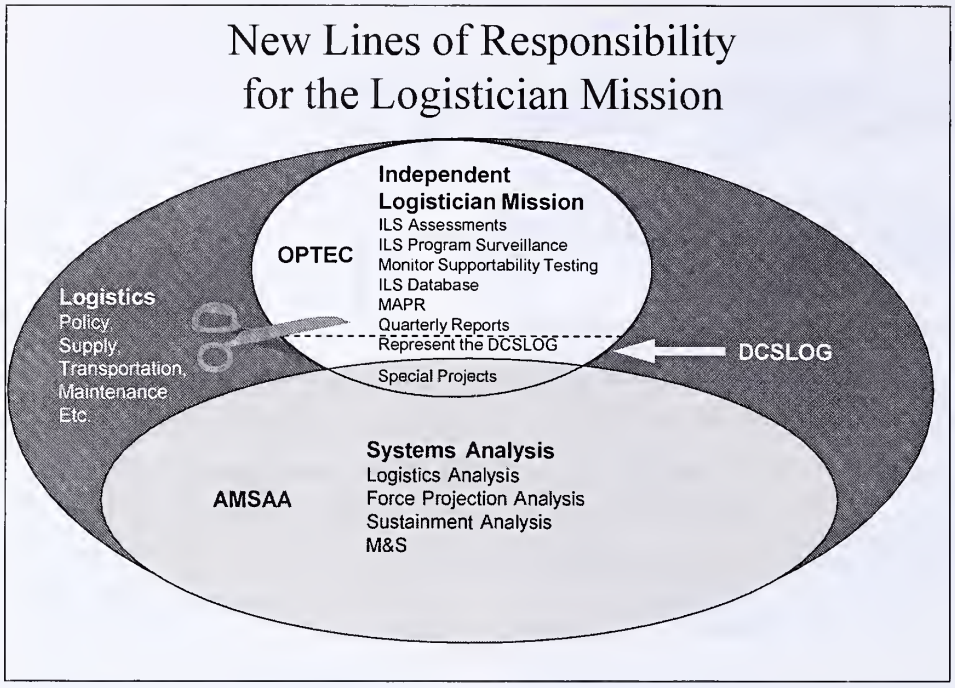

Figure 3.

ings at conferences, participate in the Army and AMC road shows, publish articles in open publications such as *Army RD&A* magazine, and revise training curricula.

Live Fire Test And Evaluation (LFT&E)

The consolidation of evaluation should have little effect on live fire testing. TECOM and SLAD will continue to perform most of the component and system-level live fire testing. The level of effort on the evaluation will remain about the same because the work years and required expertise previously devoted to LFT&E in AMSAA have been transferred to OPTEC and will continue to be applied to live fire programs and issues. In the future, the evaluator will incorporate the operational significance of LFT&E results into the single evaluation report. OPTEC will continue to rely heavily on AMC to provide technical support to LFT&E.

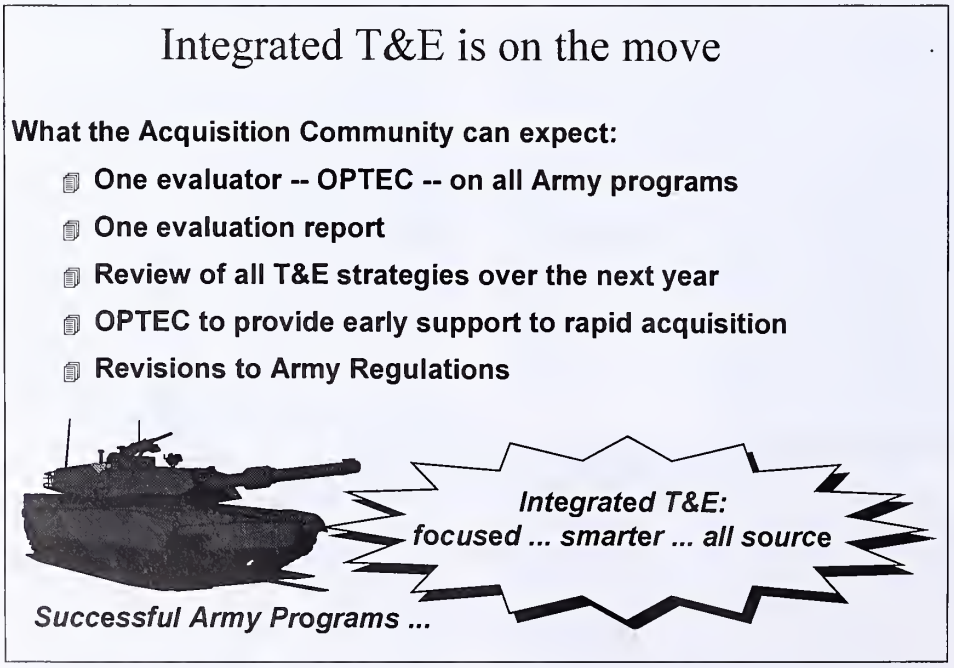

Figure 4.

Rapid Acquisition Ally

The consolidation of evaluation gives the PM a one-stop capability to involve the evaluator in rapid acquisition initiatives. Army warfighting experiments, Battle Labs, and other rapid acquisition initiatives seek help from OPTEC in the design of experiments which will produce credible data, have meaningful measures of success, and secure approval for transition into a formal acquisition program.

Integrated Logistics Support

Another area affected by this consolidation is integrated logistics support (ILS). Army leaders recognized that the 12 ILS elements and the five areas of consideration for the Army logistician could be accomplished by the single Army evaluator. The consolidation will achieve efficiencies by identifying a single agency—OPTEC—to perform ILS assessments.

As Figure 3 illustrates, OPTEC has assumed most of the independent logistician mission previously performed by AMSAA. OPTEC will integrate the ILS assessment into the system evaluation and provide ILS information as needed. There will, however, be no independent logistician representing the Deputy Chief of Staff for Logistics (DCSLOG). The Office of the DCSLOG will be represented in person at milestone decision reviews and IPRs. ODCSLOG will also review and sign test and evaluation master plans as the Army logistician. AMSAA will continue to perform logistics analyses for the DCSLOG.

What Can The Acquisition Community Expect?

There is now one evaluator—OPTEC—for all Army systems and there will be a single evaluation report. Over the next year, OPTEC will form evaluation teams and initiate a review of the T&E strategy for all Army systems. (See Figure 4.) The goal of this review will be to eliminate redundancies, combine testing where possible, exploit all sources of data, and focus T&E with the ultimate user—the soldier—in mind.

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From Industry. . .

INTEGRATED PRODUCT TEAMS AND THE SINGLE PROCESS INITIATIVE

By Robert J. Bedell
Hughes Missile Systems Company,
Tucson, AZ

Introduction

Integrated product teams (IPTs) with members representing the principle customers of Hughes Missile Systems Company (HMSC) are working together to accelerate the implementation of common processes under the Department of Defense single process initiative (SPI). The approach used to gain technical concurrence gives government IPT members a sense of ownership of the new common process and an increased understanding of contractor operations. Stronger working government/contractor relationships result at both technical and managerial levels.

Background

In May 1995, HMSC established its acquisition reform strategy. One element was to become self-governing by implementing best practices. These best practices would be common for all programs, eliminating both the non-value added requirements and the diverse, and sometimes conflicting, program-specific processing requirements for the same function. The SPI journey began early in the summer of 1995 with the question, *"How will process owners govern their operation or process in the absence of mil-specs?"* By August, after many reviews, plans were prepared to implement the initial common processes. To effect the desired changes, HMSC submitted to each program engineering change requests for each proposed common process. Unfortunately, benefits would not accrue until all programs embraced the common process. Success with this approach was marginal, since every program did not have an acquisition reform champion.

When the Department of Defense announced the common process/single process initiative in the *Commerce Business Daily* (CBD) Sept. 14, 1995, this appeared to be a simplified approach, offering the opportunity to rapidly gain customers' approval of proposed changes. Plans for responding to this CBD announcement were reviewed with the HMSC Reinvention Laboratory Management Council (now termed the Single Process Initiative Management Council) at its Sept. 28, 1995 meeting. This management council meets approximately every two months at HMSC. Membership consists of senior HMSC executives and senior government executives representing Cruise Missile (Navy), Theater Air Defense (Navy), Tactical Missiles (Army), and Conventional Strike (Air Force) program executive officers (PEOs), Defense Contract Audit Agency (DCAA), and the local Defense Contract Management Command (DCMC). The council is chaired by the local DCMC commander. On Nov. 17, 1995, HMSC submitted its first proposal requesting that common processes be implemented for 14 diverse manufacturing and engineering processes.

Although everyone was focused on making SPI successful, the CBD announcement did not describe the details of the approval process. Hon. William J. Perry, then Secretary of Defense, and Dr. Paul G. Kaminski, Under Secretary of Defense for Acquisition and Technology, both issued memoranda on Dec. 6 and 8, 1995, respectively, to clarify processing common process requests. However, HMSC, DCMC, and PEO representatives all struggled to develop a workable approval process, necessary for implement-

The approach used to gain technical concurrence gives government IPT members a sense of ownership of the new common process and an increased understanding of contractor operations.

ing a common process. At the Jan. 11, 1996, HMSC Reinvention Laboratory Management Council meeting, a specific review and approval process was defined.

IPT/SPI Process

It was agreed that technical integrated product teams (IPTs) would be created for each proposed common process with the objective of understanding the current process, identifying non-value added steps, and defining the details of the common process. They would work to eliminate these non-value added and conflicting program requirements, while providing the same or improved quality as the current process. The technical IPT would also review the implementation plan. Each of the PEOs provides a representative, in some cases one for each program, as does DCMC. HMSC provides the IPT leader. Membership is supplemented by additional government and HMSC technical personnel as needed. The IPT membership totaled 13 for the more complex processes.

The typical technical IPT has eight members. IPTs meet as often as required to achieve technical concurrence. Telephones, faxes, and e-mails are used extensively to reduce travel costs and shorten the review process. Upon reaching agreement, the technical IPT documents its agreement with copies of the agreement provided to DCMC, DCAA, each of the PEOs, and HMSC.

The technical IPT process works well by bringing the multiple government program and contractor perspectives together and aligning to a single vision of each process.

For many processes, the initial technical IPT meeting was the first time the government technical representatives ever met. It certainly was the first time many gathered together with HMSC to discuss mutual technical concerns. This has been one of the benefits of this approach. However, one difficulty facing the technical IPTs was that each member had a different perspective of the same process, which elements were important, and which tasks do not add value. Before discussing a proposed common process, the IPT had to understand these different, unique, and sometimes conflicting program and Service requirements. Only then could meaningful discussions occur to identify which elements of the process were expendable. Some technical IPT members were constrained by real or perceived desires of their program mangers and PEOs. When this occurred, the Reinvention Laboratory Management Council member from the affected PEO was requested to intervene.

Another part of the Jan. 11, 1996 agreement was creating cost IPTs for each proposed common process. These cost IPTs are responsible for determining the cost impact of the technical agreement for current contracts and the sustaining yearly cost avoidance. This IPT also develops the implementation cost estimates. The DCMC representative from the technical IPT and the HMSC IPT leader are both members of the cost IPT, which is led by an HMSC estimator. DCMC pricing and DCAA are also members of the cost IPT.

Like the technical IPT, the cost IPT is supplemented by technical experts, cost analysts and estimators as appropriate. After reviewing the technical agreement, the cost IPT establishes ground rules and assumptions for assessing impact. Once agreement on these elements is reached, the detailed cost impacts are determined.

When the cost IPT is complete, HMSC prepares the block change proposal and

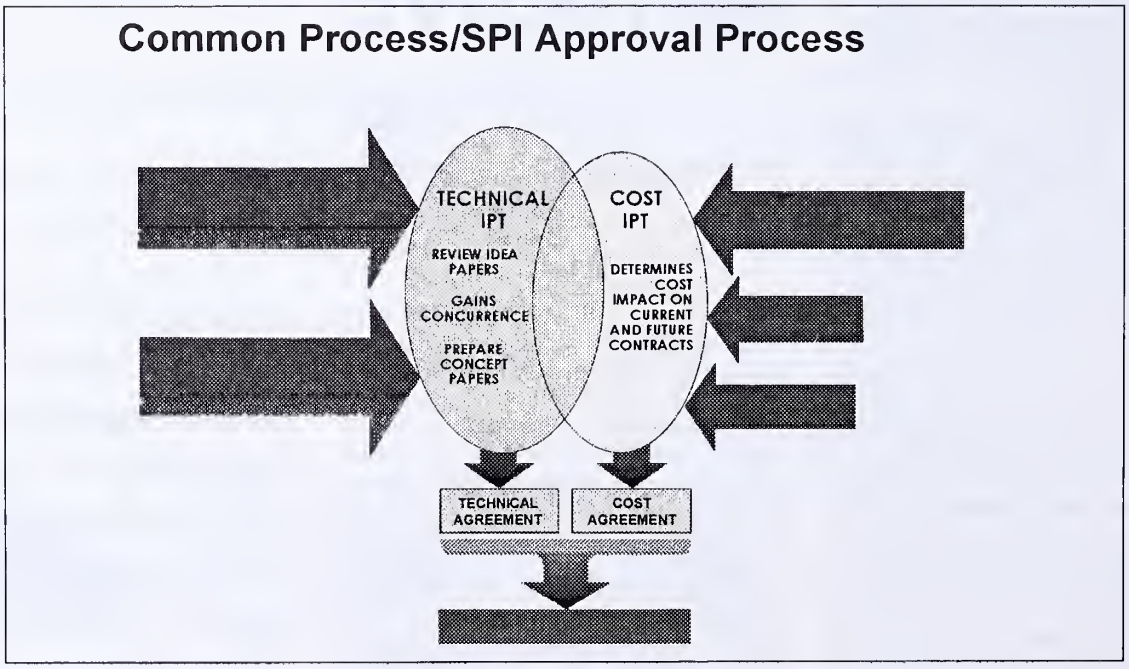


Figure 1.

APPROVED HUGHES MISSILE SYSTEM COMPANY SINGLE PROCESS INITIATIVES

Quality System	Common Electrical Component Testing
Calibration	Printed Wiring Board Fabrication
Test Equipment Certification	Configuration Management
Solder Assembly	Software Development
Hybrid Microelectronics Assembly	Parts Control
Stainless Steel Passivation	Mil Specs/Standards Revisions
Hazardous Materials Management	Factory Test Reduction
Site Safety And Environmental Program	

Figure 2.

submits it to the Division Administrative Contracting Office (DACO). PEO representatives review the specifics of the block change and forward their comments to the DACO. Then a block change can be executed. During the entire technical and cost review processes, the Reinvention Laboratory Management Council is updated with biweekly reports, and progress is reviewed at council meetings. Note the overlap of the Technical and Cost IPTs shown in Figure 1 describing the approval process.

Lessons Learned

The technical IPT process works well by bringing the multiple government program and contractor perspectives together and aligning to a single vision of each process. Meeting coordination with up to 13 members from many different organizations continues to be a challenge. Government technical members have other responsibilities and are not always available to attend an IPT meeting. As necessary, IPTs expanded their membership beyond those designated to ensure the appropriate expertise was involved in defining the common process.The additional members were signatories to the technical agreement.

One technical IPT decided after its first meeting to divide into four subteams. These subteams reported to the main technical IPT. The subteams reached agreements which were then combined into one IPT agreement, requiring coordination and approval by the main IPT. Proposing four smaller common processes may have resulted in a shorter approval cycle. One final observation is that this approach has built-in conflict between the IPT leaders and government team members.The IPT leaders are contractor personnel charged with managing the activities of their customers. This conflict was minimized by all team members who recognized the benefits of common processes and accepted the challenge.

As experience was gained with the SPI approval process, changes were identified to shorten the approval cycle. A local Common Process Management Council consisting of DCMC, DCAA and HMSC representatives was established. This council meets weekly to manage SPI activities. The council reviews the progress of each IPT, identifying potential roadblocks and implementing corrective actions. New idea papers are presented to the council before engaging the PEO representatives. For those ideas deemed appropriate, PEOs are requested to provide representatives to assist HMSC and DCMC in preparing the concept papers. Results of the weekly meetings are forwarded to the PEOs and actions assigned to DCMC, DCAA, HMSC and PEOs as needed.

A conscious effort to ensure effective communications is required of all participants. Senior contractor, PEO, program, local DCMC, and DCAA management work together to quickly resolve issues and actively encourage all IPT members to rapidly reach closure for their process.

The IPT process has been most successful in gaining customer concurrence and implementing the single process initiative. Technical agreement has been reached for all 14 of the originally proposed common processes and for five additional common processes. These technical agreements are the result of multiple perspectives representing diverse program, service, and contractor interests, aligned to a common set of requirements that satisfy all program requirements. Through January 1977, 15 of the technically approved common processes have been authorized for implementation. Block changes are being prepared for the remaining four. Figure 2 lists the approved SPIs at HMSC. Because of this successful approach, HMSC is continuing to submit to DCMC and its customers additional common processes for consideration, totaling 26 through January 1977.

Other common engineering, manufacturing, and business processes continue to be identified as candidates for change using the single process initiative. IPTs have been instrumental in implementing SPI and other acquisition reform efforts at HMSC. The results are enhanced competition, and strengthened relationships with all customers, while HMSC continues to provide the warfighters with the highest quality missile systems.

ROBERT J. BEDELL manages Hughes Missile Systems Company's Acquisition Reform Program. He holds an M.B.A. from the University of Texas at Arlington, an M.S. in electrical engineering from the University of Rhode Island, and a B.S. in electrical engineering from Norwich University, Northfield, VT. Bedell is also a colonel in the Army's Reserve Component Acquisition Corps, assigned to the Office of the Assistant Secretary of the Army for Research, Development and Acquisition.

Comanche First Flight, Jan. 4, 1996.

COMANCHE COMBINED TEST TEAM

Leading The Way To Future Testing

By MAJ Timothy M. Ward

The development of the Comanche not only leads the way for the future of Army Aviation, but it also establishes future developmental processes for aviation systems. The Comanche Combined Test Team approach with our contractors and other elements of the Army test community signals an evolutionary step in the process of weapon system acquisition.

—BG James R. Snider
Program Manager
Comanche

Introduction

The future is being tested now...the future is the U.S. Army's armed reconnaissance/light attack helicopter, the RAH-66 Comanche. The place is the Sikorsky Aircraft Developmental Flight Center located in West Palm Beach, FL. Here, the world's most highly sophisticated prototype helicopter will be the test vehicle to fly into the future. Later, it will be joined by a second aircraft for testing, with an additional six aircraft to be utilized in testing to prove the Early Operational Capability (EOC) of Army aviation's future helicopter vision.

The vision's testing will be ushered into reality by a combined team of professionals consisting of both government and contractor members, duly named the Comanche Combined Test Team (CTT). Joining with the U.S. Army in this endeavor are the program's prime contractors—Boeing Helicopters and Sikorsky Aircraft, along with subcontractors and support personnel.

Combined Testing

Combined testing is the methodology adopted for integrating government and contractor efforts during the Comanche developmental program. The intent of combined testing is to reduce the expense and eliminate the redundancy in developmental testing, specifically the government and the contractor conducting the same tests at different times for their own purposes rather than sharing data from a single test conducted jointly by both parties. By doing so, the CTT will be able to design more cost-efficient (time and money) tests which are more capable of identifying system limitations, failure modes, and inadequacies. Keeping these goals in view, the team's efforts result in a more effective and efficient development program.

The team continually strives for goal ac-

complishment through a cohesive effort with representatives from the government and contractor test communities who jointly execute the developmental flight test program. The members of the CTT work together to prepare test plans; execute the flight test program; operate the tested systems; collect reliability, availability and maintainability (RAM) data; and maintain a common flight test engineering database. This combined effort presents an evolutionary step in the developmental and operational testing process of new air vehicles such as the Comanche.

Through the developmental testing program, this new air vehicle's fight envelope and structural integrity will be determined, as well as the integration of critical aircraft systems such as the T-800 growth engine, the Target Acquisition System (TAS), and the Mission Equipment Package (MEP). Testing will also include the examination of newer technologies to demonstrate their contributions to overall system performance and mission readiness. Operational testing, will further provide answers to questions of the aircraft's effectiveness and suitability for use by operators, maintainers, and support personnel throughout the aircraft's life cycle.

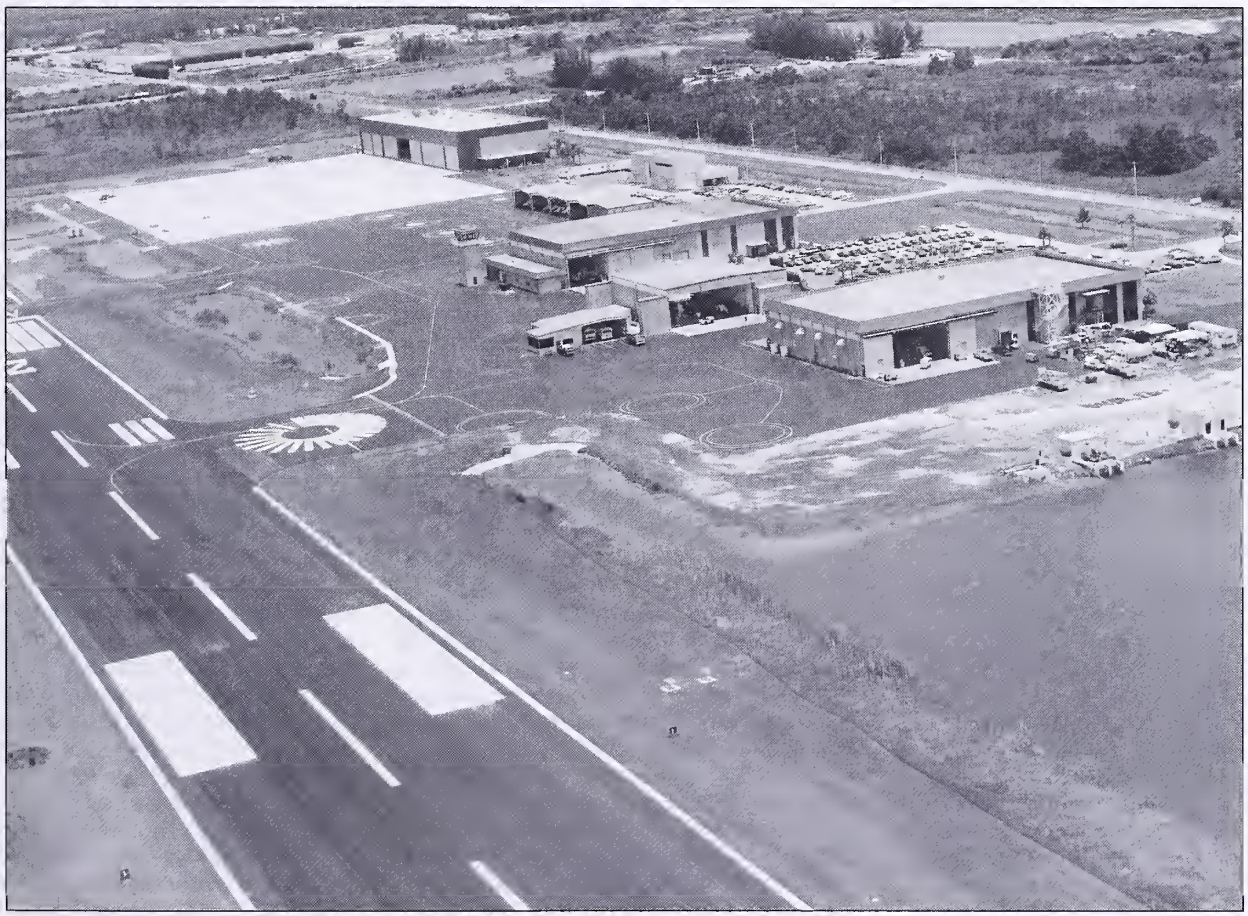
First Flight

There is no better event in the life cycle of an aviation developmental test program than to see the envisioned aircraft fly aloft for the first time. And so it was for the Comanche on Jan. 4, 1996, at West Palm Beach, FL. Flown by the Boeing/Sikorsky aircraft test pilot, the prototype succeeded in demonstrating outstanding flight and handling characteristics in a low-speed/low-altitude environment. This first 36-minute flight provided but a glimpse of future, more ambitious testing.

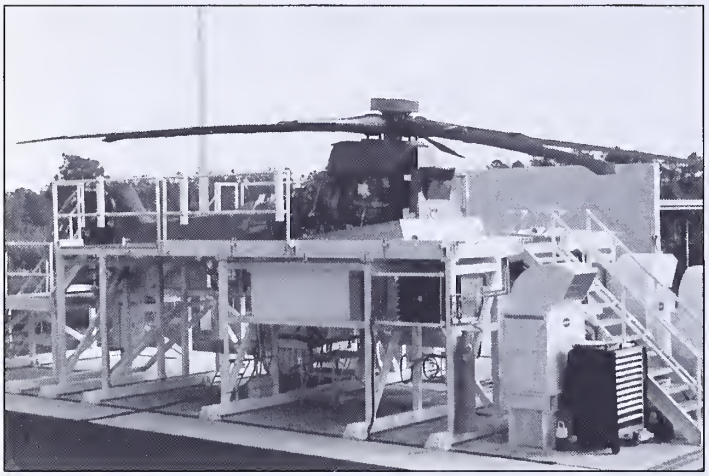
This event was matched in significance on Sept. 20, 1996, when the first U.S. Army aviator flew the RAH-66 Comanche on only the fifth flight of the aircraft. This noteworthy flight placed an entry in the annals of Army aviation history because, as a part of the CTT, it was the first time in memory that an Army test pilot actively participated in the initial development of a prototype aircraft.

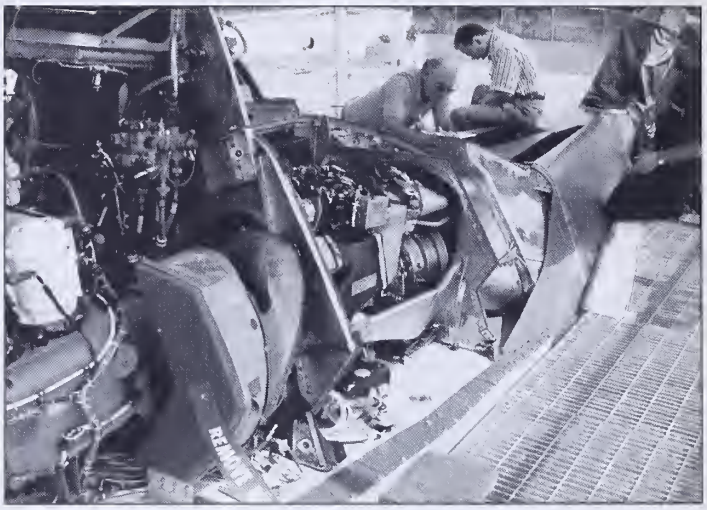
> *We (the government) get as much as we give in the CTT relationship. We will know more about the capabilities and shortcomings of this aircraft, at any stage in this program, than any other system developed and procured for the Army.*
>
> *The aircraft, thus far, has demonstrated handling qualities better than those predicted through flight simulation. Particularly impressive is that the aircraft has exhibited tremendous stability in all modes of flight tested to date.*
>
> ***—CW4 John W. Armbrust***
> ***Experimental Test Pilot***
> ***Commanche Aviation***
> ***Technical Test Center***

The 1.1 hour test flight conducted forward flight up to 80 knots and completed a



Sikorsky Flight Test Facility, West Palm Beach, FL.





Propulsion System Test Bed.

series of traffic pattern maneuvers evaluating the systems handling characteristics of the aircraft. Though this was an early flight in the development of the prototype, it provided an extraordinary view of the stepping-stone successes of the team process.

These are but two important successes of the CTT approach to testing that has been adopted for development of the Comanche. It is the CTT which plays an integral part in the testing of the Comanche and the future of testing the acquisition of weapons systems to come. In the current atmosphere of economic uncertainty and constraints, all efforts to improve efficiency and reduce costs are paramount.

Integrated Product Teams

One method being utilized to meet this challenge is in the incorporation of integrated product teams (IPTs) in the Comanche development. IPTs utilize sound business practices in close teaming among program elements to provide efficient and effective management to the acquisition program. The ultimate goal of the IPT is to serve the program and the acquisition community to provide a system that satisfies the warfighter's needs.

> *The CTT approach is an excellent example of Integrated Product Team (IPT) management. All key stakeholders (program management, users, testers, contractors, and support) involved in key program decisions are empowered and participate actively. Turn around time to resolve issues and solve problems is significantly reduced with this approach. It is working well at the CTT facility.*
>
> ***—Gilbert F. Decker***
> ***Assistant Secretary of the Army (Research, Development and Acquisition) and Army Acquisition Executive***

Developmental Flight Center

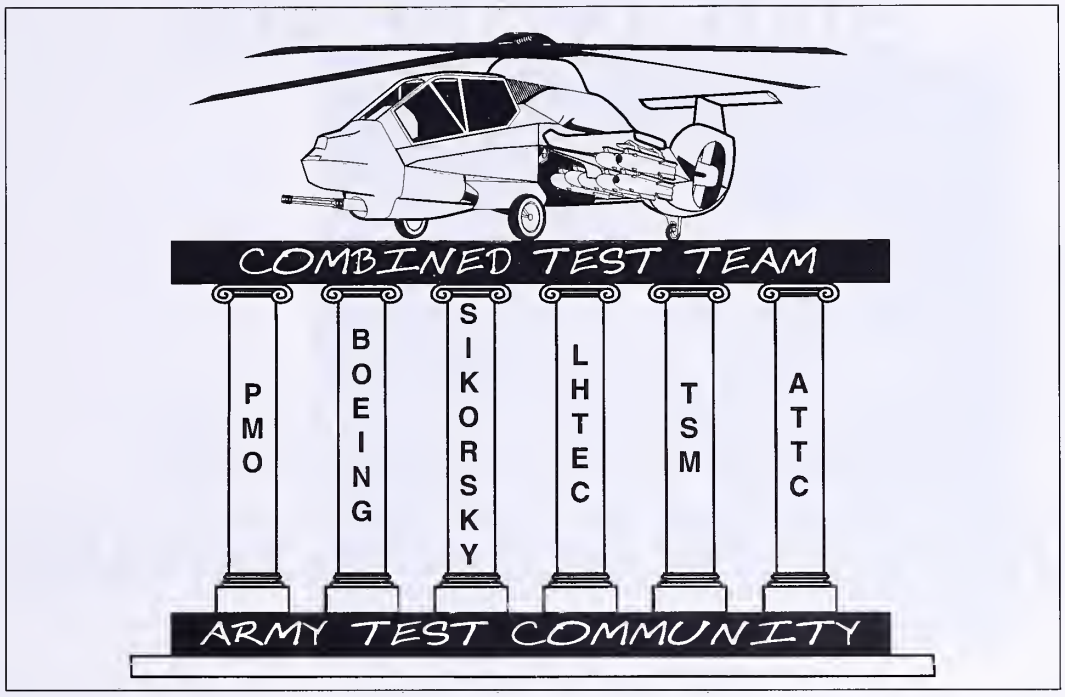
The center of activity for the combined testing is the Sikorsky Developmental Flight Center. The flight facility is located in a remote area of south Florida and is ideally suited for the conduct of flight testing. The center is equipped with state-of-the-art air vehicle test instrumentation and data processing capability. Every critical parameter on the aircraft is monitored and recorded. The resultant data is stored in a single common database accessible to both the government and contractor members of the team. Additionally, air vehicle testing is assisted by other high technology equipment at the facility.

The DFC is not only home to the prototype aircraft, but also to a unique test device. The propulsion system test bed (PSTB) is a sophisticated test platform that is able to demonstrate and perform all the dynamic components of the aircraft. The test bed allows testers to subject the system to much more severe test conditions than would be possible with the test aircraft. The stand's purpose is to lead the development and testing of the aircraft. All of the aircraft's critical dynamic components are first demonstrated and qualified for aircraft use as part a total PSTB system. The system is then subjected to endurance testing to ensure that a sufficient margin of safety is demonstrated prior to flight testing on the aircraft.

The core members of the team are collocated with the prototype aircraft and the PSTB at the Sikorsky facility. The prime contractors, the engine manufacturer (Light Helicopter Turbine Engine Company (LHTEC)), and the Army have each assigned full-time members of the team to the Florida test center. Each organization then augments the team with technical experts, as required.

There are four military members assigned to the test center as full-time representatives of the test team. The Comanche Program Manager is represented by the Government Test Director (GTD), who also serves as the Director of the Combined Test Team. The Director is the government's single point of contact to the contractors for all matters pertaining to Comanche flight test and evaluation. This leader is responsible for coordinating government activities related to the CTT. This includes the consolidating of contractor requirements for government personnel; coordinating government test observers/witnesses and the use of government facilities and services; and administering the management of government test documentation to ensure that government test objectives are incorporated in the contractor's test plans.

> *The most valuable aspect of the CAT is in having the combined talents of a diverse group of government and contractor organizations uniting together and complementing each other to accomplish a common goal. Though, at times, competing in-*



Members of the Combined Test Team.

terests occur the true team spirit prevails to ensure the success of the test objective.

—MAJ(P) Brian M. Craddock
Combined Test Team Director
Comanche Program Office

The user community's on-site team consists of a senior warrant officer and a senior non-commissioned officer from the TRADOC System Manager's (TSM) Office at Fort Rucker, AL. These highly experienced soldiers provide the contractor with a user's perspective of training/supportability, and the Army with early assessments of the aircraft's operational suitability. They assist in resolving supportability issues long before fielding of the aircraft, and train the contractor in the operation of government furnished ground support equipment, which is essential to conducting the flight test program.

The remaining full-time member of the CTT is a senior warrant officer of the Army Technical Test Center (ATTC), from Fort Rucker. This seasoned Army aviator is also an experimental test pilot/graduate of the Naval Test Pilot School. As mentioned early in the article, he has already flown the aircraft and will continue to be one of the most active participants throughout flight testing. Contractor pilots serve as pilot-in-command on all flights, with the government pilot assisting and providing first-hand knowledge about the capability/suitability of the aircraft.

The core members of the CTT are just a small part of the overall team. The team is supported by the entire Army test community, which provides technical and managerial expertise as required. To date, well over 150 government engineers, technicians, and managers have traveled to the Florida test center and contributed their talents to the efforts of the CTT.

The team is further supported by a group of RAM data collectors, also provided by the ATTC. This team of five contract employees collect data on component/equipment failures and all the maintenance actions conducted on the prototype aircraft. The data collected flows into the UNIRAM database that is utilized by both government and contractor members in developmental/operational testing. The product of their efforts will provide the team with early insights into the reliability and maintainability of the aircraft.

Adding to the CTT presence, ATTC has stationed an engineer at the Boeing Helicopter facility in Philadelphia, PA. This person provides input to test plans, witnesses test and demonstrations of mission equipment under development, and participates in the contractor's Product Development Team (PDT) meetings.

Conclusion

The Combined Test Team approach to date has been a tremendous success in the development of the RAH-66 Comanche. Its development is providing a benchmark in the future of testing of new acquisition weapons systems. The combined efforts of the Comanche team will thrust the Army's vision of the armed reconnaissance/light attack helicopter into reality.

If interested in additional information on the Comanche Combined Test Team, please contact MAJ Timothy Ward at DSN 693-0676, Commercial (314)263-0676, or e-mail: tward@st-louis-comanche.army.mil.

MAJ TIMOTHY M. WARD is the Assistant Program Manager for Test and Evaluation within the RAH-66 Comanche Program Management Office, St. Louis, MO, and has been designated to become the Director of the Comanche Combined Test Team in July of 1997. He holds a B.S. degree in aeronautical engineering, and is a recent graduate of the U.S. Army Command and General Staff College. In addition, Ward is a member of the Army Acquisition Corps.

STATE-OF-THE-ART MATERIALS AND PROCESSES BENEFIT COMANCHE AND OTHER DOD PROGRAMS

By MAJ Keith Edwards

With rapid rates of technological advancement in many fields, state-of-the art technologies introduced during a system's development life cycle are often obsolete by system fielding. This will not hold true for the Comanche helicopter. An integrator of developing, even laboratory technology, the Comanche system fielded early in the next century will be cutting-edge in every regard. One specific and telling example supporting this claim is a developing family of beryllium aluminum alloys used extensively in the Comanche Electro-Optical Sensor System (EOSS). The Comanche EOSS, comprising the housing and gimbal assembly for the aircraft's pilotage and targeting optical sub-systems, calls for a lightweight, high-stiffness material capable of being formed into highly complex configurations. The Comanche EOSS and two beryllium aluminum components are depicted in Figure 1.

Traditional materials (e.g. aluminum, titanium, magnesium alloys, metal-matrix composites, etc.), though capable of achieving complex configurations, fall short when evaluated against weight, stiffness and producibility criteria. Many are expensive to produce, and because of shortcomings in ductility and/or isotropic properties, some are restricted to limited applications.

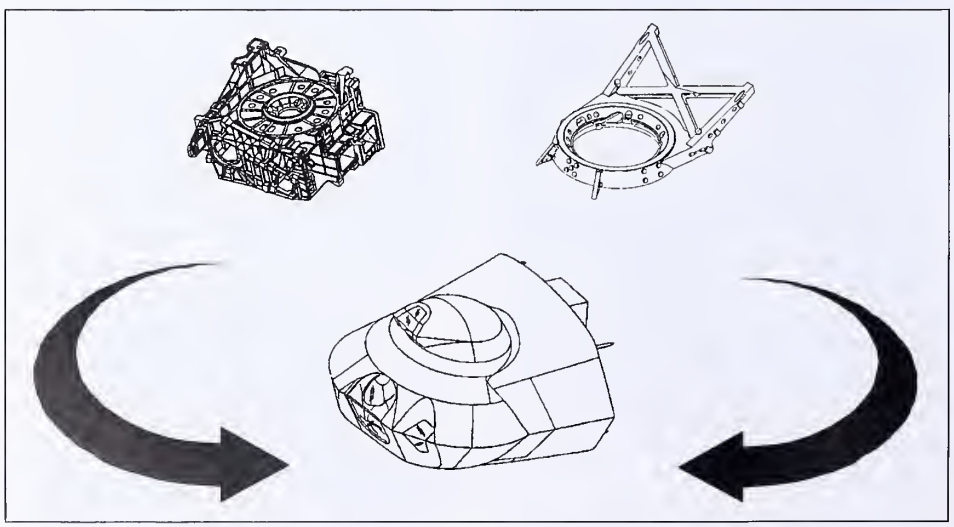


Figure 1.
The Comanche Electro-Optical Sensor System/beryllium aluminum components.

Beralcast®, a family of beryllium aluminum (Be-Al) alloys, addresses these shortcomings. Developed by Nuclear Metals Inc., (NMI) of Concord, MA, Beralcast® blends the best attributes of the primary component materials (i.e. beryllium and aluminum) and eliminates most individual shortcomings. In these alloys, the high elasticity and low density characteristics of beryllium are combined with the favorable processing characteristics and mechanical property behavior of aluminum.

Comparing properties of Beralcast® to the component materials, the advantages in its use become readily apparent. Beralcast® is 22 percent lower in density, yet three times stiffer than cast aluminum. Additionally, the material exhibits a four-fold improvement in dampening coefficient, important for stability and jitter reduction in optical systems. Also, a 40 percent lower value in coefficient of thermal expansion translates to higher tolerances and less rework for matching or mating parts. Three times more ductile than hot pressed beryllium, Beralcast® effectively eliminates brittleness as a significant drawback to the use of beryllium in many structural applications. An added benefit is that unlike beryllium, it can be welded if defective or damaged.

While beryllium is limited to configurations that can be machined or formed, Beralcast®, as the name implies, is castable. Complex, cast configurations are now achievable, whereas the machining process once claimed as scrap as much as 95 percent of input material. The highly complex, monolithic, optical platform depicted in Figure 2 clearly demonstrates the casting capability of Beralcast®.

The casting process is quite involved and begins with the preparation of the materials. This includes both the Be-Al charge materials and an NMI-developed charge stabilizing alloy composition. These materials are loaded into the melt crucible of NMI's vacuum induction melting (VIM) tilt-pour furnace, equipment specifically acquired for melting and casting Beralcast® material. A VIM furnace is depicted in Figure 3.

The furnace chamber is then evacuated and the materials are heated to sufficiently melt and stir the composition. After being at that temperature long enough to ensure degassing, the melt crucible is tilted and the composition is poured into a preheated ceramic investment mold.

The casting solidifies under vacuum within the mold chamber of the furnace, which is back-filled with inert gas to accelerate the cooling process. When the cast has reached room temperature, a high pressure water jet is used to remove a majority of the mold. After manual trimming of any remaining mold material, the cast surface is cleaned with abrasive grit blasting. If necessary, the cast can now be straightened and/or weld-repaired. It is then released for initial inspection and any needed post-cast processing. Of note is that NMI is currently the only source to have attained this level of Be-Al casting capability.

Final inspection, following any necessary post-cast processing, includes visual, dimensional, radiography, and dye-penetrant inspection processes. The inspected casting is then released for final machining. All machining is performed in shop environments that meet or exceed stringent Occupational Safety and Health Administration requirements for ventilation and safety equipment. Additionally, the machining process is tightly controlled, minimizing the generation of harmful airborne beryllium alloy dust and/or fumes.

To date, 56 Comanche EOSS components have been identified that will leverage this state-of-the-art technology. In addition, several other Department of Defense (DOD) programs are currently using, or evaluating application opportunities for Beralcast® technology. In addition to Comanche, the Army's Apache B-Kit, PAC-3 Missile Upgrade, Multiple Launch Rocket System, Hellfire Missile, Advanced Threat Infra-Red Countermeasure, Theater High Altitude Air Defense System, and the Air Force's F-22, are programs that either are, or will potentially benefit from application of

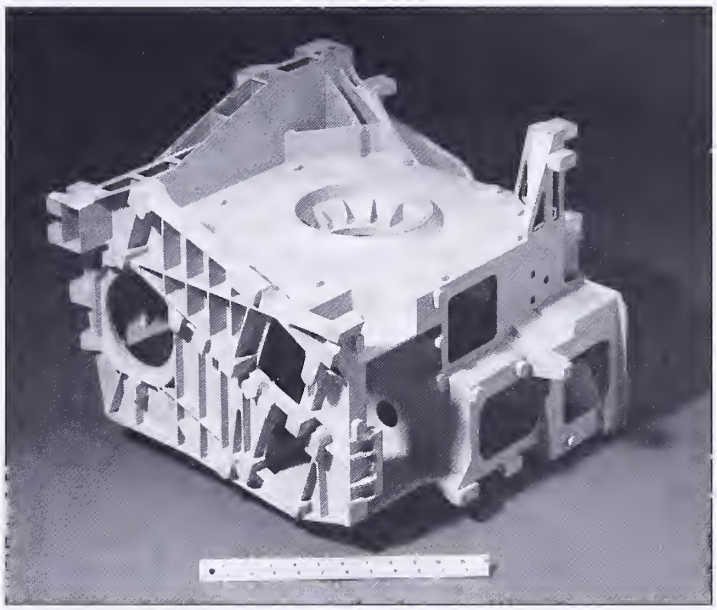


Figure 2.
Monolithic Comanche Electro-Optical Sensor System Optical Platform Casting.

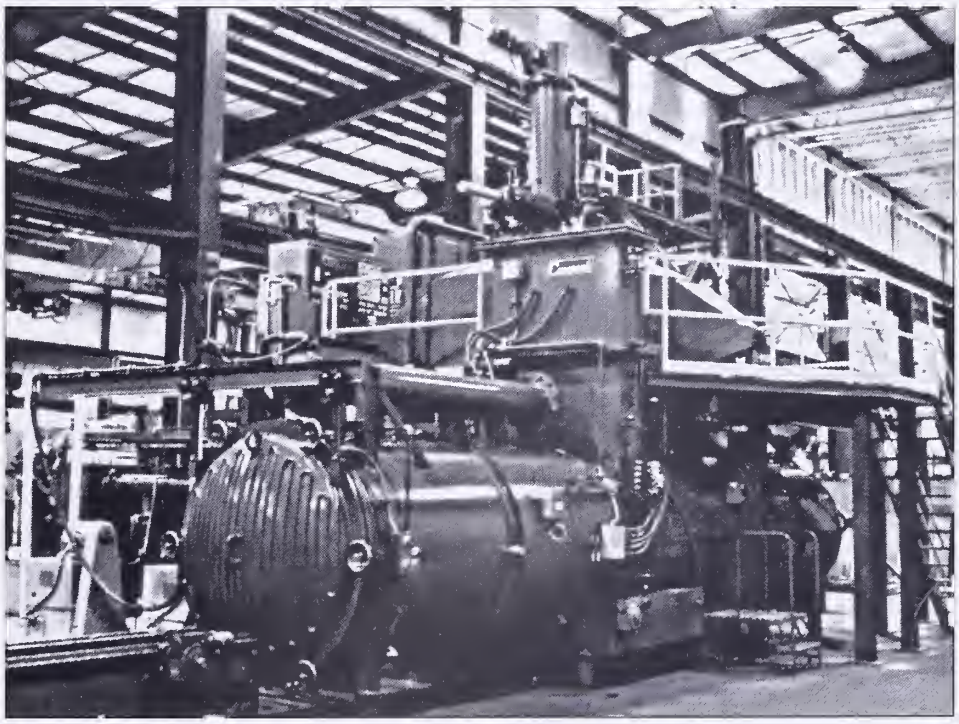


Figure 3.
Vacuum Induction Melting Furnace.

Beralcast® technology. The Navy's V-22, and the Joint Strike Fighter (JSF) programs are also candidates for Beralcast® application.

For the near term, suitable Beralcast® applications include structural housings, electronic packaging, and flight hardware. In the not too distant future, Beralcast® may serve as a lower cost and/or higher performance replacement for cast aluminum, magnesium, titanium, composites (i.e. metal and nonmetallic), beryllium, and powder metallurgy (PM) beryllium aluminum. As such, the technology will find use in light-weight night vision Forward Looking Infra-Red (FLIR) systems, missile guidance (PAC-3) and satellite components, engine gearboxes (F-22), heat sinks/exchangers (F-22 and V-22), and electrical and electronic boxes, assemblies, and enclosures. Commercial applications that readily come to mind are within the computer/electronics, medical, and recreational industries.

As compelling as the litany of current and future applications for this advanced material, is the history behind the Beralcast® development effort. Developing Beralcast® technology to the level required for successful casting of the EOSS Optical Platform was no simple endeavor. The story behind this effort began in 1991 as Lockheed Martin Electronics and Missiles (LMEM) of Orlando, FL, evaluated several candidate materials suitable for the light-weight, high-stiffness requirements of the Comanche EOSS. In this instance, an NMI advanced concept to fabricate Be-Al investment castings had merit, but called for extensive development.

In pursuit of this, LMEM and NMI (in a teaming arrangement) began a series of exploratory/developmental programs to determine the technical feasibility of this approach. Earliest efforts focused on material development (i.e. a castable beryllium aluminum composition) and casting/manufacturing process development. Persistent early problems associated with material property repeatability, mold reactivity, and composition contamination, led to a programmatic change within the Comanche Program Management Office that excluded beryllium aluminum castings from the Dem/Val phase EOSS design. LMEM and NMI, however, remained committed to the technology, and the program(s) continued with LMEM and NMI internal research and development funding.

By 1993, after more than 400 beryllium aluminum alloys had been developed and evaluated, a family of alloys meeting or exceeding Comanche EOSS requirements had been refined. For structural applications requiring strength, ductility, and producibility, Beralcast® 363 was ideally suited. Applications requiring high thermal conductivity were addressed by Beralcast® 191, while those requiring extrusions were well-suited for Beralcast® 310. Additionally, by this time, the earlier material contamination and reactivity problems had been solved through the parallel development of crucible and mold compositions.

With further refinement, a repeatable process was developed which produced precision castings of moderate size and complexity. New investment casting equipment installed during this period increased NMI's melt-capacity ten-fold to approximately 160 pounds.

The new facility and refined processes allowed NMI to successfully demonstrate casting fabrication of high quality, moderate size and complexity parts. Using the recently developed processes, NMI was able to demonstrate significant property improvement over castings poured only a year earlier. As a result, Beralcast® investment castings were reinstated into the Dem/Val phase of the EOSS by the Comanche Program Manager.

Recently, the focus of the Beralcast® program is to transition to production readiness. The manufacturing process is being further refined so that large, highly complex, and precision EOSS hardware can be repeatedly (and economically) produced. Toward this end, LMEM, NMI, and the Army Aviation Research and Development Center (AVRDEC) are co-sponsoring a series of sequential manufacturing technology development efforts, in addition to Comanche-funded development efforts. To date, these have paid off handsomely. Recent accomplishments include:

- Comanche EOSS Process Control Specification for Beralcast® castings;
- Generation of Beralcast® Material Properties;
- Large, Complex Casting Process Development;
- Secondary Support Process Development (e.g. Welding Repair, Environmental Finishes, Stress Relief);
- Nondestructive Inspection Process Development (e.g. Radiography, Dye Penetrant);
- Publication of Preliminary Beralcast® Design Guidelines; and
- Development of a Design To Cost Plan.

Near-term emphasis for the Beralcast® development effort will focus on the use of recycled material and computer modeling and simulation in the production process. By themselves, these two areas offer the benefit of significant savings for programs that adopt Beralcast® technology.

The recycling study will focus on the development of an optimized process for the use of recycled Be-Al material. Additionally, material characterization testing will determine the feasibility of substituting recycled material for virgin material in deliverable castings.

The computer modeling and simulation study will focus on optimization of feed, and gating design (i.e. for the casting mold) and material solidification modeling/simulation. Through the data gathered, these studies will allow the reduction of both the amount of material used, and the number of casting iterations required, to produce acceptance-quality Beralcast® components.

Future Beralcast® Development Programs will consist of: parallel Beralcast® research and development (i.e. NMI-IR&D) to determine other uses for the material and the associated processes; installation of an increased capacity Beralcast® investment casting facility; ore to metal conversion process development; a production facility scale-up. This phase will be a significant milestone for NMI, LMEM, the Comanche, and other DOD programs. An optimized Beralcast® technology and production-capable facilities, will translate into further advances in the state-of-the-art, dramatically more widespread use in systems of all kinds, and a concurrent lowering of associated costs.

Beralcast® technology is an exciting prospect for any system requiring light-weight, high-stiffness material in structural housing, electronic, and flight hardware components. Made available through the ingenuity, agility and dedicated research and development efforts of an industry team (i.e. LMEM and NMI), Beralcast® technology will have a significant impact on programs throughout DOD. Continued development efforts by the Army-industry team will insure that systems like the Comanche helicopter are on the forefront of those benefiting from this cutting-edge metallurgical science. Future applications for Beralcast® technology within DOD and the commercial marketplace, will be nearly limitless.

MAJ KEITH R. EDWARDS is the Procurement Officer within the RAH-66 Comanche Program Management Office, St. Louis, MO, and Project Officer for the use of beryllium aluminum in the Comanche Electro-Optical Sensor System. He is a December 1995 graduate of the Naval Postgraduate School, Monterey, CA, with a Master of Science degree in Systems Acquisition Management and Contracting.

If interested in receiving a copy of the LMEM/NMI technical article from which this article was drawn, or if desiring additional information about beryllium aluminum alloys and their uses in weapon systems, please contact MAJ Edwards at the following number: DSN 693-1489, Commercial (314)263-1489, or e-mail: kedwards@st-louis-comanche.army.mil.

THE U.S. ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY

By John J. McCarthy

Army Systems Analysis

The process of developing, acquiring, fielding, and sustaining Army materiel systems is filled with uncertainty. For more than 25 years, the Army Materiel Systems Analysis Activity (AMSAA) has been at work minimizing that uncertainty and helping to ensure effective and supportable systems are deployed to the soldier. From the initial identification of need, through concept and requirements definition, to the building of new systems and the ultimate fielding and support of those systems, the Army requires continuous analysis of effectiveness, performance, and supportability in order to make prudent and informed decisions.

AMSAA was formed in 1969 from what was then the Weapons Systems Laboratory of the Ballistic Research Laboratories to enhance the decision-making process through the increased application of broad based systems analysis to Army materiel systems. AMSAA was created as a separate reporting activity under the Commanding General (CG), Army Materiel Command (AMC) to ensure the Army developed and sustained a core analytical capability focused on systems analysis. Since that time, AMSAA analysts have conducted analysis on virtually every major Army acquisition program.

Systems analysis is a multidisciplinary function that utilizes operations research, mathematical and computer modeling, and statistical techniques to solve complex, multivariate problems. AMSAA has integrated systems analysis with engineering analysis, the physical sciences, and military science to create unique capabilities tailored to meet Army materiel analysis requirements. AMSAA develops and applies these problem solving tools and methodologies to Army materiel and logistics systems to predict performance, analyze effectiveness, identify shortfalls, compare alternatives, and recommend potential courses of action to the appropriate decision-maker.

The AMSAA mission was expanded in 1974 with the added role of independent technical evaluator of major Army programs. In 1990, AMSAA's evaluation mission was again expanded when the Department of the Army Deputy Chief of Staff for Logistics designated AMSAA as the Army's Independent Logistician, responsible for evaluating the adequacy of integrated logistics support elements in support of the acquisition process.

On Oct. 1, 1996, AMSAA refocused its efforts on its primary mission: providing systems analysis in support of Army decision making. On June 12, 1996, the Vice Chief of Staff of the Army notified the CG AMC that he was consolidating the Army Evaluation Mission into the U.S. Army Operational Test and Evaluation Command (OPTEC). This decision was based on a reengineering study performed by AMSAA as part of the Equip/Supply/Maintain Functional Area Assessment Phase I effort. That study showed significant efficiencies could be achieved through the integration of developmental and operational test and evaluation into a single end-to-end process. As a result, on Oct. 1, 1996, elements of AMSAA, the Army Test and Evaluation Command, and the Survivability and Lethality Analysis Directorate of the Army Research Laboratory each divested developmental evaluation capabilities, and the associated personnel were transferred to OPTEC.

The transfer of developmental evaluation to OPTEC has provided AMSAA the opportunity to relook the current and future systems analysis requirements of the Army and tailor its capabilities to ensure the skills and tools are in place to meet those requirements. Acquisition reform, downsizing, horizontal technology insertion, and the emphasis on modernization of existing platforms are examples of environmental changes that have altered the way the Army will acquire materiel in the future. The information and analysis required to support future Army decision making have also changed. The current AMSAA is undergoing a renaissance of timely, relevant systems analysis that supports future decisions and focuses debate at all levels on the most cost-effective, supportable Army systems for the next century. AMSAA's primary mission areas are materiel systems analysis and logistics systems analysis.

Materiel Systems Analysis Core Functions

Materiel systems analysis is accomplished within four core mission functions: item level performance analysis, modeling and simulation, systems performance analysis and risk and investment strategy analysis. These interdependent core competencies synergistically combine to provide the Army with analytical capabilities that are unique in both breadth and depth.

Item Level Performance

AMSAA is the Army's center for item level performance analysis and certified data. AMSAA utilizes automated data bases and models to characterize the functionality of Army materiel systems. Unique models and methodologies have been developed to accurately predict critical performance variables such as weapon accuracy, target acquisition, rate of fire, the probability of inflicting catastrophic damage, or system reliability. AMSAA is responsible for the generation of these effectiveness measures and for ensuring their standard use across Army and joint studies. Last year, AMSAA provided standard performance data inputs to more than 20 major Army and Department of Defense (DOD) studies for cost/performance trade-offs, risk assessments, requirements analyses, and early technology studies.

A primary example of AMSAA's unique capabilities in item level performance analysis is the recently completed Crusader risk assessment. AMSAA supported the Project Manager in conducting a risk assessment and comparison of the liquid propellant vice solid propellant technologies. These analyses highlighted liquid propellant as a significant risk in development that produced only a marginal performance advantage. Using these findings, the Army reached

a decision to proceed with the solid propellant technology for the Crusader.

As the Executive Agent for DOD for the Tri-Service Joint Technical Coordinating Group/Munitions Effectiveness Program, AMSAA applies its item level performance expertise to manage the program and to ensure standardized weapons effectiveness assessments are used across the Services. The publication of joint munitions effectiveness manuals provides single source documents for modelers, materiel developers and strategic and operational planners at all levels.

Modeling and Methodology

AMSAA's modeling and methodology capabilities support the development, linkage and accreditation of live, virtual, and constructive simulations, and provide unique tools that support systems analysis of both individual systems and combined arms environments. This modeling and methodology expertise is utilized both to strengthen the organization's internal capabilities and to provide critical capabilities to external customers.

Internally, AMSAA has resident and maintains more than 100 models and simulations, most of which were developed in-house to address specific analytical voids. These models range from component level, physics-based models to force-on-force simulations. This modeling and simulation infrastructure provides a hierarchical modeling process that is unique to AMSAA. Results from high resolution, physics-based, and system level models are used to feed the higher level force-on-force models. Interactions and findings from the higher level models are then fed back into the more detailed ones. The product is a comprehensive performance prediction capability that can be utilized to make trade-off and investment decisions prior to extensive and expensive hardware testing.

Externally, AMSAA applies its modeling and simulation expertise to a wide variety of Army programs and activities. As the Army's Executive Agent for verification, validation and accreditation of item level performance models, AMSAA assists model developers with the development and execution of verification and validation plans to ensure new models and simulations faithfully represent actual systems. Additionally, AMSAA is extensively involved in modeling and simulation accreditation across the Army.

Above the item level, AMSAA has gained extensive experience in the planning, execution and analysis of distributed interactive simulation (DIS) exercises and in the verification and validation of computer-generated forces and system simulators. AMSAA was the program manager for the recently completed Anti-Armor Advanced Technology Demonstration that has developed a credible DIS capability to support a broad spectrum of acquisition applications. In the computer-generated forces area, AMSAA led the assessment study that provided the basis for the Army's investment strategy and the decision to integrate the Modular Semi-Automated Forces and Close Combat Tactical Trainer.

Systems Analysis is a multidisciplinary function that utilizes operations research, mathematical and computer modeling, and statistical techniques to solve complex, multivariate problems.

System Performance

AMSAA integrates its item level performance and modeling and simulation capabilities to perform total system performance analysis. System performance analysis is initiated in the technology base and evolves with the system through requirements definition, the analysis of alternatives process, insertion into the acquisition cycle and then extends to fielding and sustainment. AMSAA is actively involved in the Army Science and Technology Objective process examining how emerging technologies can potentially satisfy future Army requirements.

As technologies mature and are inserted into the advanced technology demonstration and advanced concept technology demonstration processes, AMSAA performs verification, validation, and certification of performance data, provides an analytical basis for the formulation of exit criteria, conducts system performance analysis, and verifies, validates and accredits required modeling and simulation. These capabilities support the timely transition of warfighting technologies from the tech base to materiel and system specific applications.

AMSAA's linkage with the new integrated concept team (ICT) process creates an opportunity for the Army to take advantage of systems analysis even earlier in the process. AMSAA is positioned to support ICT through earlier requirements trade-off analysis before specific solutions are identified. The integration of cost as an independent variable, as part of this process will help ensure the development of cost-effective systems that will provide critical warfighting capabilities to the Army After Next.

AMSAA provides Army project managers and decision makers with comprehensive systems performance and effectiveness capability analysis for systems in the development process. Examples of systems analyses planned in FY 97 are: Crusader, AAAV, Patriot, Follow-on to TOW, the Extended Range MLRS, the Tank Extended Range Munition (TERM), and the XM 982.

Investment Strategy

Shrinking modernization budgets have forced the Army to increasingly focus its research and development efforts toward fewer critical systems and capabilities that will equip the force with the most "bang for the buck." Investment decisions across weapons systems and technologies are being forced earlier in the process, with cost effectiveness playing an increasingly dominant role in these decisions. AMSAA has developed and implemented new methodologies capable of examining decision alternatives in terms of value added, cost benefit, and total risk.

The Anti-Armor Resource Requirements Study, recently completed for the DA Deputy Chief of Staff for Operations, Plans and Strategy (DCSOPS), is an example of how systems level performance analyses can be performed across weapons and commodity areas to weigh the value of various weapons mix strategies. This analysis compared the relative performance capabilities of future anti-armor systems in the 2005 and 2010 time frames. The ranking of these systems by their contributions on the future battlefield was used to support DA DCSOPS programming decisions. AMSAA is currently working to expand those study findings to the joint armor/anti-armor arena. Future potential exists to conduct similar analyses within other battlefield capabilities, such as sensors and command and control, as well as to examine relative contributions across capabilities.

Logistics Systems Analysis Core Functions

Wholesale and retail logistics analysis, logistics modeling and methodology development, and force projection and sustainment analysis comprise the core functions of logistics systems analysis. As with materiel systems analysis, these functions are highly interdependent and collectively create a unique synergism that provides the Army with the full spectrum of logistics analysis capabilities and products.

Wholesale and Retail Logistics

AMSAA's logistics analysis expertise covers the full range of Army logistics needs, from the development and refinement of new logistics models to the evaluation and analysis of innovative or modified logistics concepts. AMSAA's studies have led to recommendations for major changes to the Army logistics system that will result in significant improvements in the supply, maintenance, and transportation processes.

The Army's provisioning process was enhanced in the late 1980s through the development of the selected essential item stock for availability method (SESAME). This effort led directly to an application of the methodology for a sustainment model, known as Readiness Based Sparing in the early 1990s. Readiness Based Sparing optimizes Class IX stocks while maintaining system readiness at a minimized cost at the division level. The methodology has been successfully demonstrated at several sites since 1990 and the National Guard currently has a unit that has used it for more than two years.

Currently, AMSAA is developing a predictive logistics supply concept to improve the supply process. The goals of the program are to provide increased flexibility and responsiveness to the customer, reduce the generation of excess, and to provide the best mix of supplies in a timely manner. The project will result in the development of a comprehensive Program Management Plan detailing a total system architecture. Other recent and ongoing wholesale logistics studies and analyses include total asset visibility, post investment analysis for JLSC, Army streamlined logistics, velocity management, single stock fund metrics, and impact of changing maintenance plans on war reserve requirements.

At the retail level, AMSAA supports the Army acquisition process with level of repair analyses and initial provisioning analyses for materiel development programs. AMSAA works with the project manager to ensure initial provisioning stocks and maintenance concepts provide adequate logistics support and best value to the Army once systems are fielded.

Logistics Modeling and Methodology

AMSAA has been instrumental in the development, application, refinement, investigation, and analysis of models to support both wholesale and retail Army logistics operations and analysis. A library of models is maintained and new ones are regularly developed as needed either to support concept analysis or to improve a current methodology. Since its inception, AMSAA has been an integral member of the JLSC Math Models Group, providing analysis and model development support across the Services.

Prompted by the logistics planning requirements of Operation Desert Storm, AMSAA developed a methodology based on the readiness based sparing approach to generate stockage lists for each supply echelon. The methodology includes techniques to estimate requirements for both combat damage and reliability failures. The model developed to support the approach became known as the Optimum Stock Requirements Analysis Program (OSRAP). Recently, AMSAA developed a graphical user interface for a PC version of OSRAP that will enable units to calculate these packages and conduct sensitivity analyses themselves.

AMSAA's Physics of Failure Program pioneered development of design and analysis tools to predict reliability and minimize potential redesign at the component level. Physics of failure is based on the fundamental principle that is not only important to understand how things work, but equally important to understand how things can fail under the intended operational environments. The approach uses physics of failure models that analyze mechanical, electrical, and chemical failure mechanisms induced by operational and environmental loads. Although currently focused on electronic circuit card assemblies, these techniques have the potential for broad-based application in the design of future Army systems.

PARASESAME is a simulation technology funded project to implement a parallel processing version of the SESAME used for requirements determination and evaluation. These enhancements to an existing model will reduce run times for large problems by several orders of magnitude and allow for sensitivity analyses and "what-if" exercises required for designing an effective, rapid response logistics system.

Force Projection and Sustainment

AMSAA is heavily engaged in analysis to support the Army planning process for sustaining our forces during operations other than war, contingency operations and in war. Currently, significant activities are ongoing in the areas of war reserves analysis, contingency package development, and field exercise data collection (FEDC).

AMSAA has been tasked by the Army to study the entire War Reserves Automated Process. The ongoing study aims to identify shortfalls in the current war reserves computation methodology and streamline the process. The results are expected to provide a considerable cost avoidance while improving the readiness of the Army's warfighting systems. A related effort, now underway, will assess the Army's capability to regenerate Army War Reserve 3 (Prepositioned Afloat Program) in support of deployment to two near simultaneous major regional conflicts.

Utilizing OSRAP, AMSAA continually develops contingency support packages for planned and potential operational deployments. Packages are developed for Class IX spare parts requirements at the Area Support Group, Core Support Group, and Direct Support Group and/or Organizational levels in support of wartime contingency planning. These support packages have been instrumental in planning logistics support and have served to assist in Bosnia, Somalia, Rwanda and numerous other recent Army operations. AMSAA developed more than 50 such packages in FY96 alone.

AMSAA is the Army agent for sample data collection (SDC). As part of the SDC Program, the FEDC Program provides quantitative and qualitative operational maintenance, manpower, reliability and logistical support data for fielded materiel systems. The FEDC Program supports combat sustainment and war reserve requirements in support of contingency forces worldwide (e.g. Operation Desert Storm, Operation Vigilant Warrior, Haiti, etc.). Field data also serves to validate critical data elements required in scientific, engineering, and logistical support studies.

Summary

AMSAA provides the Army with the critical information and analysis needed to facilitate the complex decisions required to move the Army into the next century. As resources become increasingly constrained, it is critical the Army leadership continue to have access to timely, reliable and high quality analysis on which they can base the decisions required to shape the future Army. AMSAA has developed an integrated set of skills and tools focused on its core competencies to be responsive to the breadth and depth of systems analysis requirements for the Army now and into the next century.

JOHN J. MCCARTHY is Director of the U.S. Army Materiel Systems Analysis Activity. He has a master's degree from the University of Delaware and a B.S. degree from Moravian College, both in mathematics.

SIX SIGMA

A Route To Quality And Affordability

By Diane S. Kukich

Researchers at the University of Delaware Center for Composite Materials (UD-CCM) are contributing to an effort led by United Defense Limited Partnership (UDLP) to implement Six-Sigma statistical techniques in characterizing the manufacturability and producibility of composite hull structure components on the U.S. Army Tank-Automotive Research, Development and Engineering Center Composite Armored Vehicle (CAV). A statistical yardstick for quantifying quality, Six Sigma provides a methodology for the continuous measurement and improvement of component design, manufacturing process, and performance. This work represents a first attempt to apply Six Sigma methods, which were originally developed by the electronics industry, to composites manufacturing.

UDLP is working closely with CCM's John W. Gillespie Jr. and Rushad F. Eduljee on the application of Six Sigma to the CAV-ATD (advanced technology demonstrator). Dan Coppens of Anholt Technologies, Inc., a small Delaware-based company, has served as a consultant to the project.

The work is a logical adjunct to Gillespie's general involvement in the program as a member of the CAV Technical Advisory Board and his specific activities in the effects-of-defects area. "We're focusing on defining the effects of defects in the context of repair and Six Sigma," Gillespie says.

"We think it's important to use Six Sigma as a design tool because changes can be incorporated at a lower cost if they're made early in the process," says UDLP's George Thomas. He explains that information on system requirements is flowed down to the design teams responsible for the individual components. At this stage, a Six-Sigma analysis evaluates the robustness of the design and the potential for meeting the system requirements before a significant effort is invested in a detailed design. The anticipated performance and quality prediction flows back up to systems engineering for comparison to program objectives to see whether requirements reallocation is necessary (See Figure 1).

For example," says Thomas, "if weight savings is a goal and we discover that we can actually do better than required on one component, then we can pass that savings along to another component, which can perhaps be produced less expensively because the weight requirements on it are not as stringent as originally thought. This information is valuable only if we have it early enough in the process to use it, and Six Sigma enables us to do that." Eduljee points out that it also focuses attention on potential problem areas that might not be intuitively obvious.

The Six-Sigma analysis strives to minimize overall cycle costs by minimizing the occurrence of defects. In this context, a defect is any characteristic that does not fulfill the customer requirements. The analysis is conducted at the parts, process, and performance levels. Parts Sigma characterizes the quality of the incoming purchased material; this includes items listed in the "Bill of Materials." Process Sigma quantifies the robustness of the manufacture of components or the assembly of components. The analysis to determine the Process Sigma level involves identifying the opportunities involved in the process flow and the associated defect rate for each opportunity. Performance Sigma measures how well the fabricated components and assemblies meet their performance requirements.

The Six-Sigma analysis of the composite structure for the CAV-ATD is implemented through a series of spreadsheets used as worksheets and scorecards. Eduljee explains that the scorecards are arranged in a hierarchy from component up through hull structure assembly, with each scorecard being supported by separate linked spreadsheets that determine the parts, process, and performance Sigma levels. These scorecards offer a structured approach to manage and analyze all data used in making design decisions.

The scorecard hierarchy for the CAV is shown in Figure 2. It consists of the individual scorecards at the component, sub-assembly, and top-level assembly rolled up to the system level. As a first step, the number of opportunities at the parts, process, and performance levels is identified for each component being analyzed. An opportunity may be defined as a chance to do an operation successfully. The number of opportunities may also be considered an indicator of the complexity of the part, with a larger opportunity count indicative of a more complex part. The occurrence of defects is characterized by the defects per unit (dpu). So that the analysis is not biased by the complexity of the component, the dpu is normalized by the total number of opportunities to give the defects per million opportunities (dpmo). The dpmo is then related to the sigma level through the normal distribution.

According to Six Sigma experts at Texas Instruments—developers of the Integrated Product Development Process adopted by Team CAV—Six Sigma is a "reach which often requires revolutionary changes." A typical reasonably well-controlled process is usually about Four Sigma (sigma being the standard deviation), or 6,000 dpmo. Thus, Six Sigma, which translates into a quality level of no more than 3.4 dpmo, represents a 2,000 times improvement over "conventional wisdom."

"In a way, we're breaking the boundaries of Six Sigma by using it on an ATD," says Thomas, "because most people associate this methodology with the manufacturing

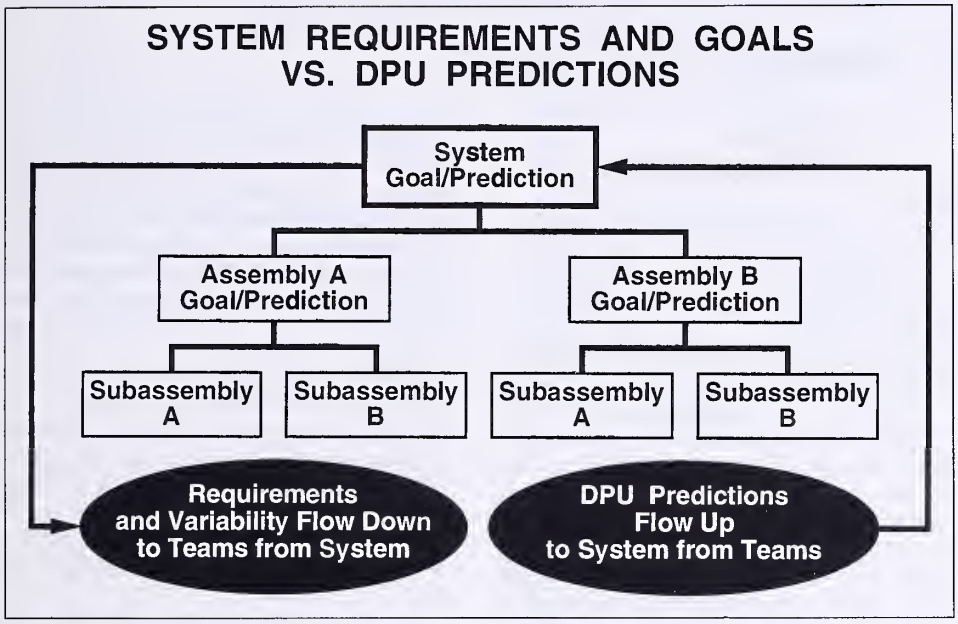


Figure 1.

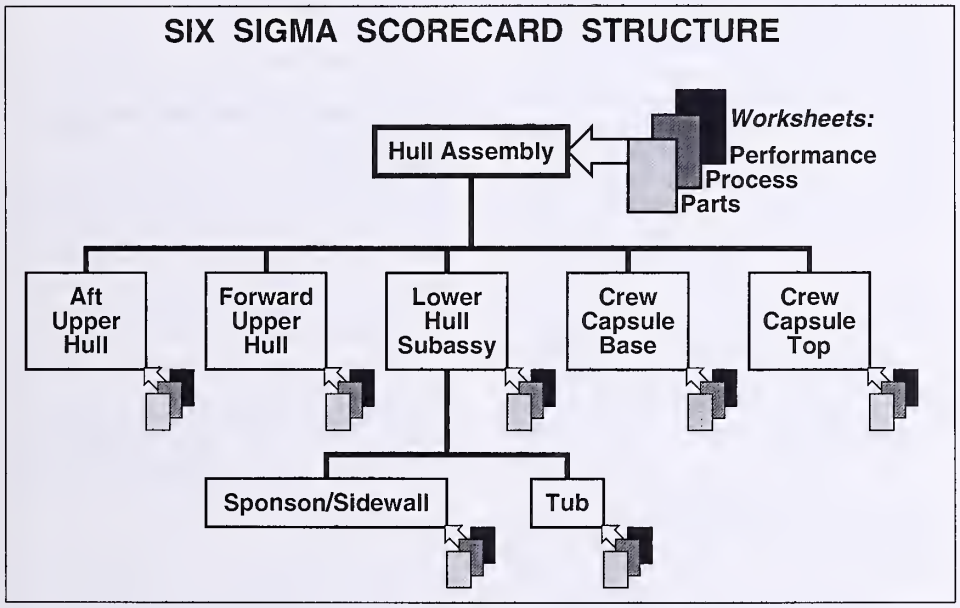


Figure 2.

environment, where it's used to reduce defects in a process that produces thousands or even millions of parts. In an ATD—where you're making only one—it's more a simulation and predictive tool." For example, in applying Six Sigma to the CAV lower hull design, the team determined that an initial design exceeded the specified weight. Consequently, the team revised the design and ultimately lowered weight and cost; had they continued with the original concept, they would have added cost and cycle time to a concept that had very little chance of meeting requirements. "This example," says Thomas, "captures the essence of Performance Sigma and the benefit of its application early in the program."

Affordability is the primary motivation for the application of Six Sigma to the design of an ATD, as it relates cost and value to each of the steps in the design scorecard. "Sometimes we can identify a change that can be made," says Thomas, "but we then have to answer the question 'why make it if it isn't going to impact cost?' We want to identify and attack the defects that have the largest impact on cost. There are a variety of ways we can do this—removing the part, adding automation, changing the process..."

To that end, Six Sigma is being linked to cost modeling work being done at CCM by Scott K. Jones, Associate Professor of Accounting. Jones's efforts have focused on the use of activity-based cost (ABC) accounting for the resin transfer molding (RTM) process. Just as one-for-one part replacement of composites for traditional materials like metals is often not technologically sound, neither is it economically advantageous. Similarly, Jones points out, the information systems and costing models and methods developed for use with metals do not "translate" well in a decision-making environment when composites replace steel and aluminum.

"This turns out to be a fundamental problem," says Jones. "In the metals context, the major elements of cost—materials, labor, and overhead—can be estimated independently. But with composites, the processing options and manufacturing methods are so closely linked to design that these traditional costing methods are ineffective in discriminating among alternative designs." ABC accounting shows promise as a tool for composites engineering design teams but only when it is employed during the early stages of design. Thus, it is extremely compatible with the application of Six Sigma to design.

According to Thomas, "Future DOD weapon systems will require higher levels of product quality at lower cost and greater added value, so UDLP has structured development efforts on the CAV-ATD program to improve quality on present and future systems. As a result, the program has employed a number of tools to aid in creating the systems design, as well as to develop a database to satisfy future Army needs."

Current efforts at CCM are aimed at applying Six Sigma to other DOD programs as well, including the Tuskegee integral armor program, through Thomas's membership on the advisory board for that program. "Our vision is that Six Sigma coupled to cost models will enable us to priority rank the major sources of defect and cost," says Gillespie. "From a research perspective, the information lets us focus on the most critical/high pay-off topics."

DIANE S. KUKICH is Editor at the Center for Composite Materials at the University of Delaware. *She gratefully acknowledges the assistance of John W. Gillespie Jr. and Rushad F. Eduljee (UD-CCM) and George Thomas (UDLP) in preparing this article.*

MACHINE TRANSLATORS

Still, Voices Of The Future

By Joe Sites

Introduction

In its September-October 1994 issue, *Army RD&A* magazine published a short article, "Machine Translators: Voices of the Future." The article had two purposes: highlight the difficulty of the task of producing machine translators and propose some small interim measures that could be taken to reduce the load of the human translators. Subsequent to publication of the article, Army Materiel Command-Field Assistance in Science and Technology (AMC-FAST) produced a demonstration model of its "Computer Assisted Translation Program" (CATNP). CATNP provided a means to store translations and to make limited changes in the final document. More concrete translation work was done by Daniel Smith, AMC-FAST Science Advisor, XVIII Airborne Corps. He was tasked to provide a small machine translator which could scan documents and provide an immediate "word-for-word" translation. Within a remarkably short time (six months), Smith provided a prototype to XVIII Airborne Corps. This machine has proven very valuable. Upgrades to the prototype, to include more languages, are currently in progress. Work toward producing machine translators continues to make significant progress. There are some excellent programs for limited use, but a true machine translation system still remains "A Voice of the Future." Why? The following is an attempt to put in perspective the task faced by machine translators.

The Human Brain

The human brain, which contains 100 billion neurons and 1,000 billion (trillion) glia, is seriously challenged by the process of translation. To properly connect all these neurons and use the right glia, the human spends years just learning to speak. Then, in school and from his environment, the human learns the vocabulary and grammar of his language and the nuances of meanings. For a person to translate to a foreign language, he must have similar capabilities in the second language. Even making the correct sounds in this second language must be learned. Can the problem be solved? The above problems make a solution difficult and tedious, but it can be accomplished. With patience and proper direction, we can have machine translators. The following is an attempt to provide an insight into how we can achieve the goal.

Basically, a machine translator must complete four steps:

- Recognize complete sentences;
- Analyze each word in each sentence;
- Arrange words in proper grammatical sequence; and
- Determine functional and referential equivalent in the second language of each word analyzed in the first language.

Step 1 can be solved within reasonable limits through a rather straightforward mechanical process which does not need to be covered in this article. The real meat of the translation is found in steps 2-4. To give some insight into how the computer can do steps 2-4, let's ask our computer to translate into German:

THE CAT CAUGHT THE MOUSE.

A word-for-word translation in this case will be close to being correct. It should be. It is a short and simple sentence. However, in short and simple sentences, serious mistakes can be made unless the rules are followed. A concrete example occurred to the author in 1958. A German Army Third Corps order to the 36th U.S. Artillery Group stated,"...the 36th Arty Gp HQ will report to the Alert Area..." It was translated into, "...the 36th Arty Gp HQ will report to the Officers Club..." Imagine the problems and pitfalls to be found in a complex sentence. It is fair to say that unless procedures used in the following example are employed by machine translators, there is a serious likelihood of serious errors in machine translations. Now, Step 2.

Analysis Of Each Word

Step 2 is broken down into three substeps, which are:

- Obtain dictionary grammatical description of words;
- Determine function and relationships of words; and
- Describe words in terms of function and relationships.

Dictionary Definition

As a part of machine translation, there is a requirement for a dictionary, (analytical lexicon) in each language, as well as a bilingual dictionary. The lexicons contain not just words, but also information on: parts of speech, number, gender, root words, and other modifiers (e.g. for verbs, transitive or intransitive, and tense). In this example of English to German and with two lexicons in place, the computer begins its analysis by looking up each English word in the English lexicon. The computer then records the word's part of speech, part of speech category, and other characteristics, to include number, gender, root word. In looking up each word of our example sentence and extracting pertinent data, the computer finds the following:

The
Article

Cat
Noun, singular

Caught
Verb, transitive, past tense of infinitive "to catch"

The
Article

Mouse
Noun, singular

Function And Relationships Of Words

Each word has a function. Functions transmit ideas of who, what, where, how, why and allow one word to modify another. Words also have relationships to each other. The relationship of words is generally dependent on their functions. The knowledge of the functions and relationships of words is essential for translations. Now that the computer has gotten its lexicon descriptions, it must determine the functions and relationships of the words in the sentence. This is another way of saying it must determine what the sentence means.

The first questions is: What is the subject of the sentence? In a simple English sentence, the subject is normally a noun. With instructions to determine the "subject," the computer would look for nouns in the list of dictionary definitions. Programmed properly, it will determine that "cat" and "mouse" are both nouns and that one of these two words could be assigned the function of "subject." In English, the normal word order is subject, verb, object. Using this as a discriminator, the computer would assign the "subject" function to the word "cat." As the "subject" of the sentence, the word "cat" is assigned the "nominative" case. To properly translate this word in many languages, we should know the gender. In English, this is not important, so we will leave that blank and let the computer work it out later.

	Cat
Part of speech	Noun
Number	Singular
Function	Subject
Case	Nominative
Gender	_____

Now that the computer has determined the subject of the sentence, it needs to determine: What are we saying about the "cat?" Is the cat doing something? Are we describing the cat? To do either, we need a verb. Therefore, the computer must go through the dictionary definitions and find a verb. Fortunately, the computer finds only one verb, "caught." The computer must now analyze this word. Step 2 told the computer that it was not just a verb, but a transitive verb in the past tense, and that the infinitive is "to catch." Since the verb must agree with the subject in number and person, the computer determines that the word caught is third person singular.

	Caught
Part of Speech	Verb
	Transitive
	Past Tense
	Infinitive: to catch
Function	Action
	3rd person
	Singular

Transitive verbs must have an object. Since "catch" is a transitive verb, the computer must now look for an "object." As with "subjects," in simple English sentences, the computer can look for a noun to be the "object." Since there is only one noun which has not been assigned a function, the computer assigns the "object" function to the word, "mouse."

	Mouse
Part of Speech	Noun
	Singular
Function	Object
Gender	_____

We haven't stopped with the functions and relationships analysis yet; the computer analysis must describe each word in detail. For "cat," we know that it is singular; it is the subject; and its case is nominative. What else do we need to know about "cat?" The computer must now look for words that are associated with "cat." There is only one: the first "the" which is an article. Since "the" states which cat, it must agree in number and case with the word "cat." Therefore, the computer can now assign the following data to the first "the."

	The (cat)
Part of Speech	Article
Number	Singular
Case	Nominative
Gender	_____

The computer still has one more word to analyze; the second "the." The computer will note that the word following the second "the" is the noun "mouse" and, by association, modifies "mouse." As with the subject "the," the object "the" must agree in number, case and gender with "mouse." Therefore, the second "the" is singular. It is in the accusative case and, as with the first "the," its gender is not determined. Summarizing what we know about the second "the," we have the following:

	The (mouse)
Part of speech	Article
Number	Singular
Case	Accusative
Gender	_____

Description Of Words

Collecting the individual word descriptions we have the following information:

The	Cat	Caught	The	Mouse
Article	Noun	Verb	Article	Noun
Singular	Singular	Transitive	Singular	Singular
Nomi-	Subject	Past Tense	Accusa-	Object
native	Nomi-	Singular	tive	Accusa-
	native	Third		tive
		Person		

Arrange Words In Proper Grammatical Sequence For 2nd Language

With the analysis complete, the computer can now begin its translation using the word order for the language of concern. There are different word orders in different languages (subject, verb, object; subject, object, verb; verb, subject, object). German, unfortunately, changes its word orders, based on certain modifying conditions. (These conditions involve more detail than needed here). For expediency, we assume that the word order for this sentence is subject, verb, object, and we can get on with obtaining the correct equivalents for our English words.

Determination Of Functional And Referential Equivalent

The computer will begin searching for the subject. It finds the word "cat." The computer then goes to the bilingual section of its dictionary and determines that the word "cat" in the singular nominative case in English is "Katze" in German. The computer then goes to the German lexicon and determines that its gender is "feminine." The computer then looks for the verb and finds caught. It then goes to the infinitive "to catch." It enters the bilingual dictionary with "catch" and finds the German infinitive to be "fangen." Again, going to the German lexicon, the computer can find that the singular third person, past tense of "fangen" is "fingt." This is entered as the verb. The computer then looks for the "object" and finds "mouse." With the word "mouse" the computer goes to the bilingual dictionary and finds "maus." From the lexicon, it determines that it is a feminine word. It then must determine the singular accusative form which it determines to be "mause." Now for the "the's." The computer goes to its dictionary and finds "die." It then looks for the singular nominative, feminine gender of "die." It is "die." The "mouse the" is the only remaining word to be translated. The computer then looks up the singular accusative form of "die" and finds "die."

Putting this all together, the computer spits out the translation:

"DIE KATZE FINGT DIE MAUS."

Conclusion

If you think that the computer did too much work just to have a correct translation instead of a word-for-word translation—that it doesn't make that much difference, then the fault is in the simplicity of the example. Accurate, grammatically correct translations by machine require an analysis of each word and an adherence to grammatical rules. This is a difficult task. It can be done; it should be done, but it should be taken a step at the time. Effort needs to be spent on simple solutions. With acceptance of simple solutions, then machines, like children, can advance to more complex language.

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THE ENVIRONMENT FOR COOPERATIVE R&D WITH CANADA

By LTC Ronald M. Janowski

This is the first of two articles by LTC Janowski on cooperative R&D between the United States and Canada. The second article will appear in a future issue of Army RD&A.

> *"Hierarchy of Materiel Alternatives. In response to operational requirements, priority consideration shall always be given to the most cost-effective solution over the system's life-cycle. Generally, use or modification of systems or equipment that the Department already owns is more cost-effective than acquiring new materiel. If existing U.S. military systems or other on-hand materiel cannot be economically used or modified to meet the operational requirement, an acquisition program may be justified and acquisition decision-makers shall observe the following hierarchy of alternatives: (1) the procurement (including modification) of commercially available systems or equipment, the additional production (including modification) of already-developed U.S. military systems or equipment, or **Allied systems or equipment; (2) cooperative development program with one or more Allied nations;** (3) new joint Service development program; and (4) a new Service-unique development program. Important in this evaluation process for new or modified systems are considerations for compatibility, interoperability, and integration with existing and future components or systems."*
>
> ***— DoD Directive 5000.1***
> ***15 March 1996***
> ***(bold print added by author)***

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We say it...
We know it's a 'good thing'...
But do we really practice international acquisition?

Of course the answer is 'yes,' but it's a qualified 'yes,' and international cooperative research and development (R&D) can be done better. The point of this article is not to catalog the existing international programs with Canada; rather, it is the account of an experiment—an experiment with the aim of improving cooperative R&D under the conditions of a specific international relationship.

"The STANREP"

The Army Materiel Command (AMC) has five U.S. Army Research, Development, and Standardization Groups worldwide. The roles and missions of these groups are probably not common knowledge within the Army community, and the position itself is known to most as simply "the STANREP." Such a title further clouds the question, often leaving the questioner with only a vague image of soldiers sharing NATO-standard 7.62mm ammunition in a dark and muddy foxhole somewhere.

In fact, however, the STANREPs are on the dynamic convergence of international cooperative R&D. Their charter is broad and their mission is surprisingly far more worthy an acquisition challenge than the moniker "STANREP" might imply. The STANREP's business is, of course, to 'keep a hand in' the standardization business. But perhaps more importantly, it is to focus on **facilitating cooperative R&D between the two countries in support of U.S. Army requirements.**

This is an area of great potential; but conditions are frequently fluid, and onsite representation is often pivotal to success. Unusual to most military assignments, the STANREP Office in the Canadian capital of Ottawa, like the others in Europe or Asia, is physically remote from the 'home office' at AMC headquarters in Alexandria, VA. It is a condition which establishes initiative as not just a favored asset, but indeed as a prerequisite for daily operations. As if straddling icebergs in choppy seas, the STANREP hopes to first recognize, and then to facilitate communications between U.S. and host-nation projects that may either complement or supplement one another towards a common need. This 'circus trick' is done under the ever-changing political and economic conditions present in each country. Process experimentation and innovation necessarily become familiar first steps in the challenge of mission advancement.

Canada and the Acquisition Environment

The process really begins with understanding the current conditions. In assessing the acquisition environment, the STANREP must become familiar with the key acquisition players of both countries. (See Figure 1.) In the case of the U.S. Army, it is familiarizing oneself with the U.S. Army Battle Labs, the Army Research Laboratory (ARL), and AMC's research, development, and engineering centers (RDECs). In the case of Canada's defense labs, it is Canada's "RDECs," that is, the defence research establishments (DREs). This assessment is cru-

cial. The STANREP will effectively have no starting point if there is no working knowledge of what the U.S.Army user wants, what the U.S. developer community is doing about it, and where Canada might contribute to the cause.

But beyond the national defense agencies, and representing an environment equally critical to success, is the host country itself. Canada is receptive to cooperative R&D with the United States. In fact, cooperative defense development and production sharing between the two countries dates back longer than 50 years to Canadian industrial support during World War II. Today, it is a relationship that is extensive, interwoven, and expected. In cooperative terms, the world's longest undefended border often blurs to transparency. Canada is pragmatic of its close bonds with the United States: the bow-waves of the American ship-of-state are quick to rock Canada's comparative skiff. But to be successful, the United States must keep in mind Canada's unique and pressing political and economic conditions.

Despite its comparable geographic mass and a culture that often mirrors our own, Canada is wary of the constant and potentially overwhelming influence of the United States. Canada's population is a tenth of ours; her total military (Army, Navy, Air Force) is soon to number just less than 67,000 to our Army's 495,000 (projected); and her defense R&D budget in 1996 is about $130 million (U.S. dollars) (roughly what the U.S.Army spends annually on transition research between technology base work and system-specific work). It is a budget that is small and is getting smaller yet as Canada tackles a national debt proportionately larger than that of the U.S. debt.

Operationally, Canada strongly supports her historical role as perhaps the United Nations' (UN) premier peacekeeping force. Between 1947 and 1995, Canada has sent nearly 13,000 troops (discounting unit rotations) overseas on UN missions, and today, despite stringent economic conditions, can boast of nearly 3,200 soldiers at 17 sites around the world (as of this writing).

A practical concern for Canada's defense R&D managers is that a conceptually-attractive cooperative effort with the United States not bankrupt Canada's much smaller defense R&D budget. To better manage those precious funds, Canada's Defence Chief of Research and Development (CRAD) has defined specific technology thrusts (Figure 2). In accordance with these 'technology vectors,' all CRAD projects must directly tie to one or more thrusts, which, in turn, directly support Canadian user requirements. CRAD's primary focus is in basic and exploratory research, but includes some advanced research as well.

Canadian defense contractors will normally complete final system development, although CRAD may remain involved as a "consultant." Appropriate to these thrusts and similar to the evolution of the Battle Labs in the United States, Canada's military user representatives (and their operational requirements) are becoming a growing part of the defense R&D scheme in Canada (although Canada does not intend to establish a formal "Battle Lab" structure at this time).

Ultimately, the Canadian environment comes down to the following five points:

• **Early Involvement.** The earlier the involvement in the acquisition cycle, the better the cooperation between the United States and Canada. Early involvement has multiple benefits. Primary among these is a characteristic of any early acquisition cycle involvement: achieving the greatest impact for the dollars spent. But if Canada's budget should demand withdrawal from the cooperation at

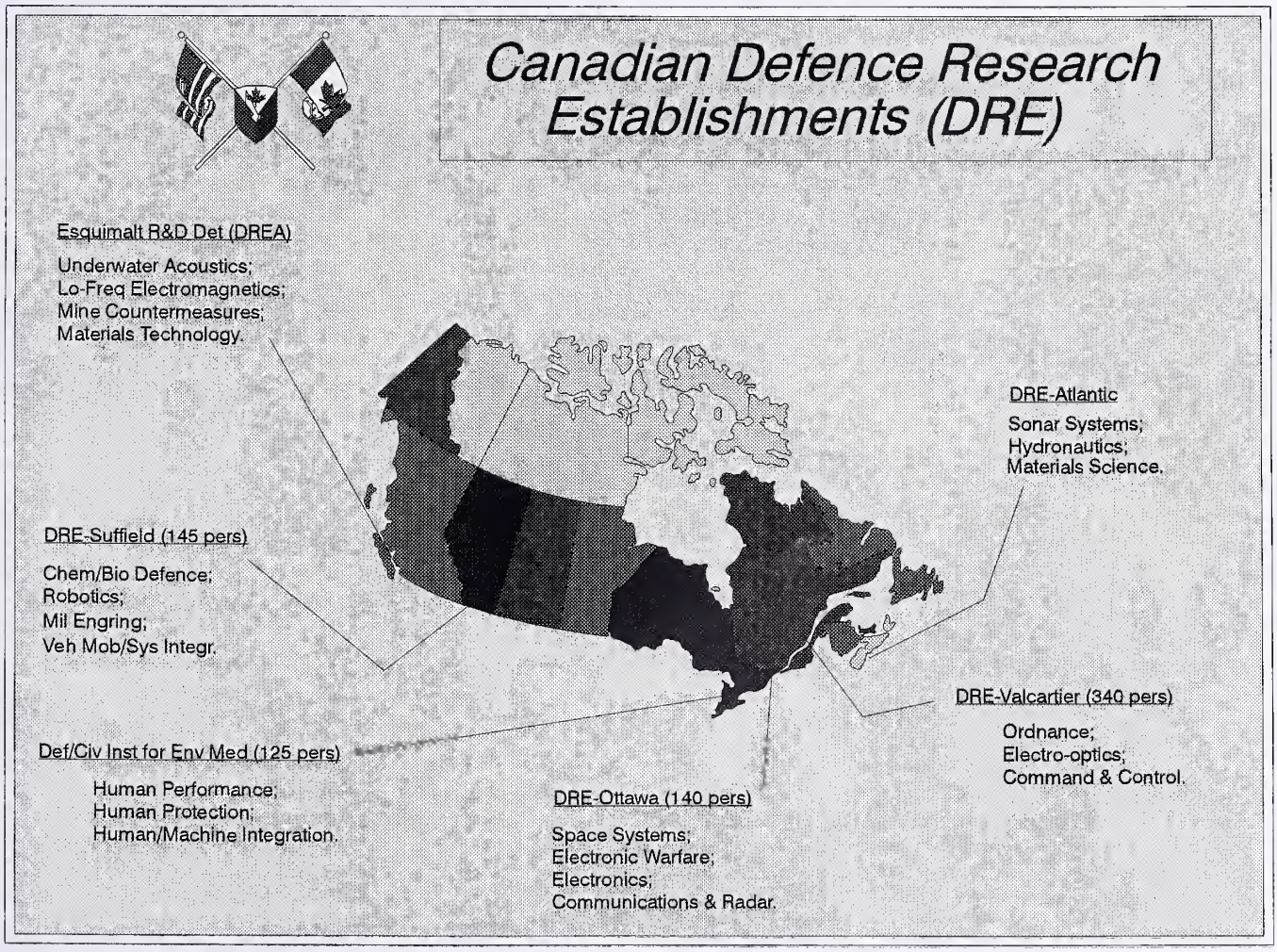

Figure 1.

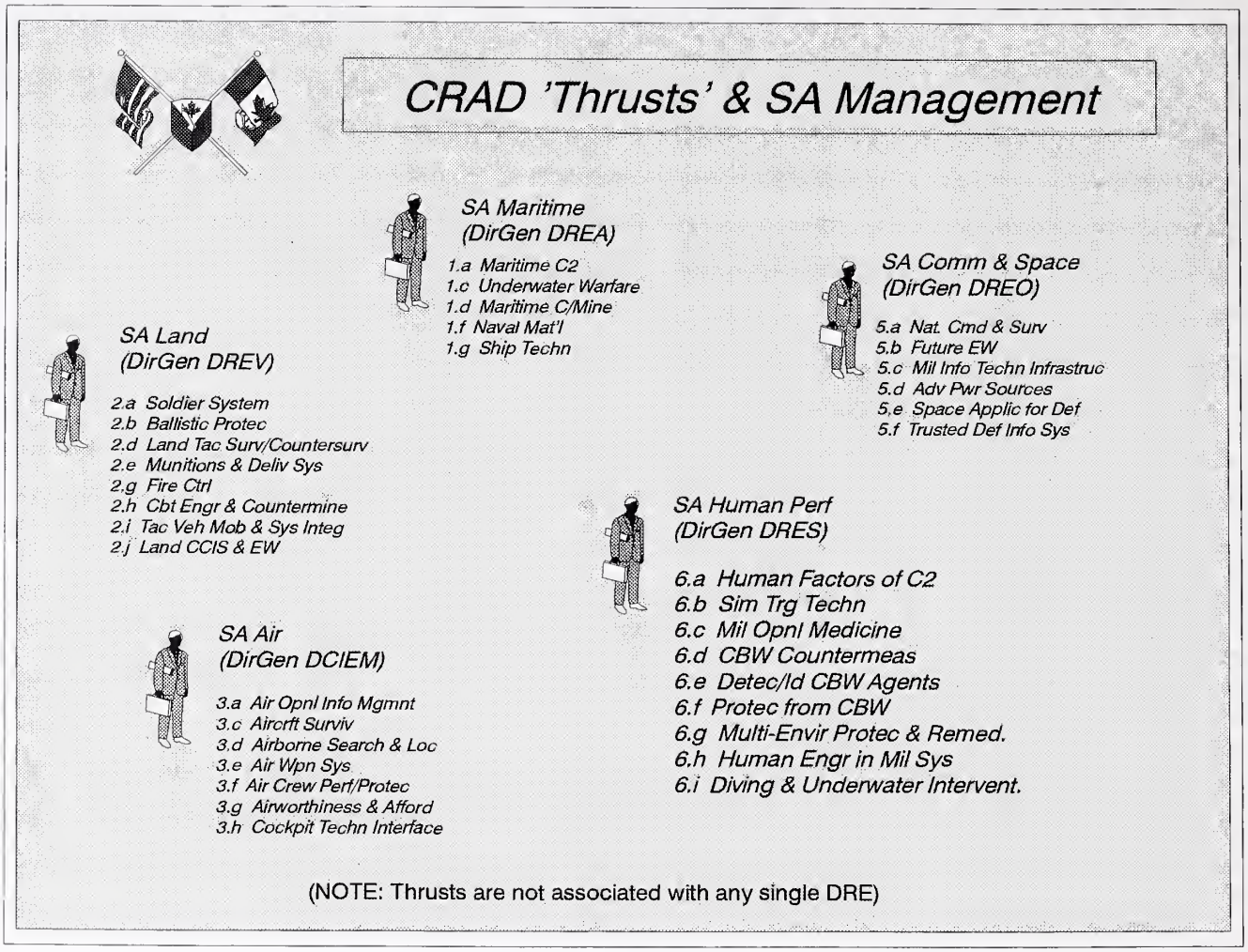

Figure 2.

some point, Canada is still left with a base system that both lends to improved standardization with the United States and (hopefully) leaves a favorable experience towards future cooperative projects.

• **Optimize Basic and Exploratory Research.** Although fully capable of advanced research and system development, particularly by commercial defense contractors, Canada's strength within the DREs is in basic and exploratory research.

• **'Niche' Technology Strengths.** Canada has world-class defense laboratories. But with budget constraints, Canada cannot possibly cover the same scope as does the United States. As a result, Canada has specific, focused, 'niches' in which cooperation may truly be of potential benefit to the U.S. Army. These 'niche' technologies include electronics, communications, chemical and biological research, soldier system support, and non-metallic mine detection technology, among others.

• **Political/Economic Issues.** Entering 1997, Canada is a country in change. Like all western nations, Canada is struggling to come to grips with an economy still adjusting to the post-Cold War environment. But Canada is also struggling with the challenge of adapting to the post-Cold War world, and striving to balance the military they need with that which they can afford. An important Canadian issue is that of Quebec's sovereignty and the future of the Canadian confederation. These issues could not only sap available monies away from the total defense budget, but could also unsettle Canada's near-term freedom to lock in cooperative research ventures.

• **Canadian Applicability.** As dictated by CRAD's technology thrusts and by the Canadian government, any defense R&D that Canada pursues must be directly applicable to Canada. Plus, because of the shrinking market impact of Canada's shrinking military, the technology essentially must be useful to both military and civilian markets (dual-use technology). Much of this spirit is present in Canada's establishment of the Technology Partnerships Canada (TPC) fund, $200 million per year dedicated to 'seeding' the development of Canadian technology base research, primarily in the fields of defense, aerospace, biotechnology, materials, and manufacturing. While the 30-year-old Defense Development Sharing Program memorandum of understanding no longer has a dedicated fund cite in the national budget, the TPC offers hope for the building of cooperative research and development today.

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From The Director, Acquisition Career Management Office (ACMO)...

On Feb. 3, 1997, LTG Ronald V. Hite, Director of the Army Acquisition Corps (AAC), and LTG Frederick E. Vollrath, Deputy Chief of Staff for Personnel, conducted a Personnel Functional Assessment (PFA) for the AAC. They assessed the size, position structure, personnel inventory, utilization, advanced civil schooling, and career development for both the military and civilian components of the AAC. They reviewed legislation and key initiatives that will continue to drive development of a small professional corps of acquisition leaders. The PFA confirmed that the AAC is on the right track. Our military and civilian acquisition workforce programs more fully comply with the intent of the Defense Acquisition Workforce Improvement Act. Most AAC members meet or exceed the education, training, and experience requirements established by the Department of Defense, at all levels. However, we must continue to work to improve our credibility within the Army. Whenever possible, we must show how the AAC supports current Army missions. In addition, all AAC members, military and civilians, must keep a warfighter focus and stay current in the operational art. Operational-related acquisition assignments for AAC field grade officers and operational orientations and training for civilian members are areas for future emphasis. Thanks to all who provided topics for this very successful PFA.

The first AAC transfer board selected 39 officers from year groups 76, 78, 82 and 83 for return to their basic branches (YG 77 had sufficient volunteers so no officers from that year group were selected by the transfer board). Most of the lieutenant colonels selected for transfer are being assigned to U.S. Army Training and Doctrine Command combat developments positions where they can apply their knowledge of the acquisition process in addition to their basic branch experience. All year group 82/83 majors selected for transfer are going to locations where branch qualifying jobs exist (i.e. BNXO, BNS3) to make them competitive for promotion and command in their basic branch. The next transfer board is scheduled for June 1997 and will consider officers from year groups 79 and 80. If the second board were held today, it would have to select 73 officers for transfer back to their basic branches. Volunteers for transfer are still being accepted by the Military Acquisition Management Branch at the U.S. Total Army Personnel Command. Call your assignments officer if you're interested.

The 1996 Colonel Board selected only 22 AAC officers for promotion. This was the minimum number established in the board instructions. We are still looking into the causes of our low selection rate, however, one fact is clear. The Officer Efficiency Report remains an area which requires improvement. In addition to clear, concise comments on future potential, the report must effectively convey to all board members, in laymen's terms, what the officer accomplished during the rating period. Managing large amounts of money does not necessarily impress board members. What does impress them is what the officer achieved as highlighted in the following examples: "Through this officer's efforts, four Brigades worth of equipment was fielded...", "...IOC was reduced by two years...", "... a savings was achieved which allowed the procurement and fielding of 100 more units.", etc. Also, descriptors such as "will," "should," and "could," are to be avoided since they indicate that the officer requires additional improvement. Lastly, long, fancy titles that are hard for even acquisition officers to understand must be avoided. Where possible, describe your acquisition position in operational Army terms. For example, a deputy PM is like an executive officer; an R&D Coordinator is like an S3 operations and plans officer; and an APM for logistics is like an S4 log officer. Senior raters must rate enough officers so that the best of the best stand out. Their narrative comments must clearly rank the rated officer relative to the other officers they rate. Recommendations on promotion, schooling, and future program management and command potential must be included.

The Deputy Director, Acquisition Career Management, Mr. Charles, myself, and members of the Acquisition Career Management Office (ACMO) staff have started a new round of visits to major installation and acquisition centers. These visits include updates on our AAC initiatives, feedback sessions, individual and group discussions and interviews, so be looking for information on the dates we will be in your area.

Read about two significant developments in career management, which took place in December. First, a memorandum of agreement was signed, formalizing the responsibilities of the Civilian Acquisition Management Branch and the Functional Acquisition Specialists. Second, the Individual Development Plan (IDP) Policy Memorandum 96-02 was finalized, providing implementing guidance, instructions and the IDP form. Both documents contribute to the ACMO's goals to provide centralized management and career planning for civilian acquisition workforce members.

Many of you have asked about the status of the Competitive Development Group for 1997. An information update is included in this issue of *Army RD&A*.

The new AAC homepage is up and running! See the advertisement on page 48 in this publication for more information. The homepage is an excellent source of information and opportunities available to the entire acquisition workforce.

I strongly urge you to take advantage of the near-term training and education opportunities, which are highlighted on page 49 of this issue. The entire 1997 calendar is printed on page 50 to aid you in planning for future opportunitics. These opportunities may not be around forever, so act now!

Congratulations to the 22 officers selected for colonel, the 10 acquisition professionals selected for ICAF, and the 48 graduates of the Materiel Acquisition Management Course.

As always, I appreciate your comments and ideas and look forward to hearing from you soon!

COL Thomas V. Rosner
Director, Acquisition Career Management Office
Pentagon, 3E427
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703-697-6291 (DSN 227)

Competitive Development Group Update

Here is the latest news on the Competitive Development Group (CDG)! There were over 700 applications submitted by Corps Eligibles and GS-13 members of the Army Acquisition Corps (AAC) for the CDG program. Of these, 680 applications arrived prior to the deadline. The CDG Selection Board, which met in February, will forward its results to the convening authority, the Deputy Director for Acquisition Career Management, Keith Charles, for approval and release. All applicants will be notified of selection or non-selection at that time. In addition, an after action report will be included in the notification letters so that applicants can see the qualifications of those selected for the CDG.

An orientation session for the 25 successful selectees and their new supervisors will be held in the Northern Virginia area during late March or early April. Each of the candidates will be notified and asked to provide input for the preparation of an Individual Development Plan and have other information available for the orientation session. This information will be contained in the notification packets sent to the selected applicants.

In addition to personal notifications, the selectees will be posted on the AAC Home Page, and the names of the FY97 CDG

Year Group will be sent to the Army acquisition community and civilian personnel activities.

We are very pleased with the response to the CDG and the high quality of the candidates who applied. For those who do not get selected this year, we encourage you to begin preparing for next year's selection board. The announcement for the FY98 CDG Year Group will be published in late summer 1997. Those who applied this year must reapply if interested in being considered by the FY98 CDG Selection Board.

MOA Formalizes Role For Functional Acquisition Specialists

A Memorandum of Agreement (MOA) between the Deputy Director, Acquisition Career Management (DDACM) and the Director of Officer Personnel Management, U.S. Total Army Personnel Command, signed in December 1996, establishes an agreement regarding the role of the Functional Acquisition Specialist (FAS) in centralized management of the Army Acquisition Corps (AAC). The FAS is responsible for providing centralized management of civilian AAC members. Centralized management, a key initiative resulting from the AAC Process Action Team report, will facilitate the career and leadership development of AAC members. The FAS will facilitate acquisition personnel actions and insure all required data is correct. This MOA is one step further toward the DDACM goal to develop the best possible professional corps of acquisition leaders.

IDP Policy Memo 96-02 Signed

On Dec. 20, 1996, Keith Charles, Deputy Director, Acquisition Career Management (DDACM), signed the Army Acquisition Corps/Workforce (AAC/AAW) Policy Memorandum No. 96-02, which provides implementing guidance, instructions and the Individual Development Plan (IDP) form. This Memorandum implements policies established in DoD 5000.52M, Acqusition Career Development Program and in AAC/AAW Policy Memorandum 96-01, Career Development as a Mission, dated April 1, 1996. Memorandum 96-02 pilots the hard-copy form to familiarize employees and supervisors with the requirement for an IDP and to encourage them to place more emphasis on career planning. The field has been encouraged to provide input regarding this pilot form. Your input will be considered for incorporation into the final automated version, which will enable employees to complete their IDP on the Web. Automation of the IDP form will facilitate our enforcement of the implementation of IDP policy guidance. We will notify AAC/AAW members when the automated IDP form is available. The AAC goal and vision is to create a professional corps of highly trained and educated acquisition leaders. As amplified by Policy Memorandum 96-02, "Carefully formulated career plans, documented on the IDP, are the means to achieve this goal."

Charles Thanks AAC Selection Board for ICAF

The Deputy Director for Acquisition Career Management, Office of the Assistant Secretary of the Army (RDA), Keith Charles, publicly thanks the following people for serving on the Army Acquisition Corps (AAC) selection board for the Industrial College of the Armed Forces (ICAF):

- **COL Steven Dasher**, Board President - Director, Task Force XXI, Headquarters, U.S. Army Materiel Command;
- **Joseph Butler** - Project Manager, Arrow, PEO, Air & Missile Defense;
- **Estherlene Morse** - Policy Representative, Defense Acquisition Regulatory Council, Office of the Assistant Secretary of the Army (RD&A);
- **Harry Cunningham**, Board Scribe - Director of Technology, Test and Evaluation Command Test Center, Aberdeen Proving Ground, MD;
- **Linda Gentle** - Chief, Program Management Division, Assistant Project Manager for Production, MLRS Project Office, PEO Tactical Missiles, Redstone Arsenal, AL;
- **Richard Williams** - Chief, Policy and Administration Division, U.S. Army Cost and Economic Analysis Center, Falls Church, VA;
- **Dr. James Nelson** - Director, U.S. Army Medical Materiel Development Activity, U.S. Army Medical Research and Materiel Command, Fort Detrick, Frederick, MD; and
- **David Shaffer** - Chief, Logistics Analysis Activity, U.S. Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, MD.

Their willingness to serve on the board reflects greatly upon themselves and the Army. Their dedicated service benefits the Army Acquisition Corps and the Army by providing the best possible representatives to ICAF.

AAC Announces ICAF Selectees

Deputy Director, Acquisition Career Management Keith Charles is pleased to announce that the following AAC members have been nominated to attend the Industrial College of the Armed Forces (ICAF), beginning in August 1997:

Name	*Acquisition Category*	*Location*
Michael L. Albarelli	Engineering (S)	Office of the Program Executive Officer (PEO) Command, Control and Communications Systems Fort Monmouth, NJ
David Atherton	Comptroller (K)	Office of the Assistant Secretary of the Army (Financial Management and Comptroller) (OASA(FM&C)) The Pentagon
Elizabeth K. Brock	Comptroller (K)	U.S. Army Communications Electronics Command Fort Monmouth, NJ
Gordon L. Campbell	Contracting (C)	U.S. Army Logistics Management College Fort Lee, VA
Eugene J. Del Coco	Program Management (A)	Office of the PEO, Ground Combat Support Systems Picatinny Arsenal, NJ
Gregory Doyle	Contracting (C)	U.S. Army Medical Research Acquisition Activity Fort Detrick, MD
Gene D. Duncan	Engineering (S)	Headquarters, U.S. Army Materiel Command Alexandria, VA
Martha E. Gabriel	Program Management (A)	Office of the PEO, Intelligence, Electronic Warfare and Sensors The Pentagon
James J. King	Comptroller (K)	Office of the Assistant Secretary of the Army (Research, Development and Acquisition)
Setsuko McGinnis	Comptroller (K)	OASA(FM&C) The Pentagon

Congratulations to these individuals on their selection to attend ICAF. Names of these selectees have been forwarded to the National Defense University for final approval. For more information, contact James Welsh at (703)805-4161, or DSN 655-4161.

A New Army Acquisition Corps Homepage

The new Army Acquisition Corps (AAC) Homepage is fully operational! The newly designed site, at http://www.sarda.army.mil/dacm, will assist members of the AAC and the acquisition workforce in obtaining information related to their professional development. The homepage offers information on news, publications, training,

workforce, policy, contacts, organization, and links to other pertinent web sites. A visit to the homepage will provide easy access to information about career opportunities, career development guidelines, career management updates, professional publications, education and training opportunities and points of contact for additional information. The homepage is updated frequently, so make sure you check it out often!

Acquisition Education and Training Opportunities

The 1997 Acquisition Education and Training Catalog is newly published and being distributed widely throughout the Army. It is published in loose leaf format so that it can be revised rather than republished as changes are made. The catalog is also available in its entirety on the Army Acquisition Corps (AAC) homepage, at **http://www.sarda.army.mil/dacm** under Training. Application forms are included and can be downloaded for your use.

The AAC encourages you to take advantage of the following opportunities to further your education and training. The opportunities listed have nomination and/or application dates in the March/April/May timeframe. (See the Training and Education Calendar following this article). For eligibility, prerequisite, and application instructions, please consult the catalog. Other opportunities will be addressed in future issues. For information on all education and training programs, contact the Army Acquisition Career Management Office, Education and Training Division at (703)805-4160, DSN 655-4160.

Naval Postgraduate School, Monterey, CA Master of Science in Management

• **Acquisition and Contract Management, Sept. 15, 1997**—The Acquisition and Contract Management curriculum is an interdisciplinary program which integrates mathematics, accounting, economics, finance, behavioral science, management theory, operations/systems analysis and specific courses in acquisition and contracting. Students include officers and civilians from all DOD Services, the Coast Guard, and other nations. The curriculum is designed to provide students with the skills to serve effectively in hardware systems buying, field contracting, contract administration, and contract policy offices. The program is 18 months with a one-week orientation prior to the start of the program. The program may be shortened if courses have been previously completed. Evidence of completed courses must be approved by the Department Chairman.

Completion of the curriculum leads to the M.S. degree in management and satisfies the Defense Acquisition University (DAU) training requirements through Level II in contracting, systems engineering, software acquisition management, and program management; and Level III in test and evaluation. The curriculum satisfies one year of experience in the student's acquisition career field.

• **Systems Acquisition Management, Sept. 15, 1997**—The Systems Acquisition Management curriculum is an interdisciplinary program designed to integrate business principles, management theory, operations/systems analysis, and engineering applications. It is uniquely tailored to Defense acquisition management and provides intensive exposure to the fundamental principles of the acquisition environment. The courses in this curriculum present the structure of principles of the acquisition environment including the acquisition management structure, the decisions and problems facing the Defense acquisition manager, the various forces at work within industry and government, and the impact of acquisition policies and strategies. Students include officers and civilians from all DOD services, the Coast Guard, and other nations. The program is 18 months with a one-week orientation prior to the start of the program. The program may be shortened if courses have been previously completed. Evidence of completed courses must be approved by the Department Chairman.

Completion of the curriculum leads to the M.S. degree in management and also satisfies the Department of the Army training requirements through Level I in contracting; Level II in software acquisition management and systems engineering; and Level III in program management and test and evaluation. This curriculum also satisfies the acquisition core course requirements (Acquisition 101 and 201), as well as the Army's Materiel Acquisition Management (MAM) Course at Fort Lee, VA. The curriculum also satisfies one year of experience in the student's acquisition career field.

University of Texas at Austin

• **Master of Business Administration, Aug. 17, 1997**—The M.B.A. program at the University of Texas is among the most rigorous and most prestigious business programs in the nation. Because the University of Texas is in the forefront of technology exploration and development, maintaining a broad perspective on emerging technologies, students will remain in the mainstream of Defense-related scientific and technical activity during their academic pursuits. The program is 18 months in length.

University of Texas at San Antonio

• **Master of Business Administration with Concentration in Management of Technology (MBA/MTEC), Aug. 11, 1997**—The MBA/MTEC program offers students with a non-technical background the opportunity to study business administration while developing special expertise in the management of technology. Students can focus their elective courses on developing general managerial skills applicable to technology based organizations, leading professional and technical employees, and integrating the various functions of an organization in today's rapidly changing technological environment. The program lasts 18 months.

• **Master of Business Administration with Concentration in Information Systems, Aug. 27, 1997**—This M.B.A. program offers qualified students the opportunity to study business administration while developing special expertise in information systems. Students can focus their elective courses on developing general managerial knowledge in the design and implementation of information systems, management of communication technologies, principles of data base management systems, and principles of end-user computing. The program lasts 18 months.

• **Master of Science in Management of Technology, Aug. 27, 1997**—The M.S. program is aimed at meeting the growing demand for managers who can assess, manage and help bring advances in technology into the marketplace in the form of innovative products and services. It is designed for students with a technical background, preferably with an undergraduate or graduate degree in science, engineering, or mathematics. This program is a joint effort of the College of Business and the College of Sciences and Engineering, and includes courses from both colleges. The program lasts 18 months.

U.S. Army Logistics Management College Fort Lee, VA

• **Materiel Acquisition Management Course (MAM), July 21, 1997**—The course is designed to provide a broad spectrum of knowledge pertaining to the materiel acquisition process. It covers national policies and objectives that shape the acquisition process and the implementation of these policies and objectives by the U.S. Army. Topics covered include: acquisition concepts and policies; research, development, test and evaluation; financial and cost management; integrated logistics support, force modernization, production management; and contract management. The course lasts seven weeks.

The following is a list of courses contained in the Army Acquisition Corps, Army Acquisition Workforce Civilian Training Opportunities catalog. Copies of the catalog are available on the SARDA Homepage (http://dacm.sarda.army.mil) and from local civilian personnel officials.

Chapter	Program Title	Eligibility Grade**	Length of Program	Dates of Program	Nomination Suspense Date
Long-Term 1	Naval Postgraduate School - MSM (Acquisition & Contract Mgmt) Monterey, CA	GS-14/15	18 months	15 Sep 97 Jan 98	15 Apr 97 Sep 97
1	Naval Postgraduate School - MSM (Systems Acquisition Mgmt) Monterey, CA	GS-14/15	18 months	15 Sep 97 Jan 98	15 Apr 97 Sep 97
1	University of Texas, Austin - MBA	GS-14/15	18 months	17 Aug 97	15 Apr 97
1	University of Texas, San Antonio - MBA (Mgmt of Technology) (MBA/MTEC)	GS-14/15	18 months	11 Aug 97	15 Apr 97
1	University of Texas, San Antonio - MBA (Information Systems)	GS-14/15	18 months	27 Aug 97 12 Jan 98	15 Apr 97 6 Sep 97
1	University of Texas, San Antonio - MS (Mgmt of Technology) (M.S./MOT)	GS-14/15	18 months	27 Aug 97 12 Jan 98	15 Apr 97 6 Sep 97
1	University of Texas, Austin - Senior Service College Fellowship	GS-14/15	10 months	Aug 97 - Jun 98	1 Mar 97
1	School of Choice	GS-14/15	Various	Various	120 days prior to class start date
1	LEGIS Fellowship for Executive Development - Washington, DC	GS-13/14/15	12 months 7 months	Jan - Dec 98 Jan - Aug 98	5 Sep 97 5 Sep 97
Part-Time 2	University of Texas, Austin - IC2 Institute - ExMS (Held at DSMC, Ft. Belvoir, VA)	GS-14/15	12 months	Aug 97	Apr 97
2	Univ of Pennsylvania - ExMSE	GS-14/15	24 months	6 Sep 97 5 Dec 97	15 Apr 97 5 Sep 97
Seminars 3	Harvard University - JFK School of Government	GS-15	2 months	29 Sep - 21 Nov 97	15 Apr 97
3	Josephson Institute of Ethics Marina Del Rey, CA	GS-15/SES	5 days	Mar 97 Aug 97 Jul 97 Nov 97	120 days prior to beginning of start month
3	Weapons Systems Mgmt Workshop Ottobrunn, Germany	GS-13/14/15	3 weeks	15 - 26 Sep 97	15 Apr 97
3	Federal Executive Institute Charlottesville, VA	GS-15/SES	4 weeks	Oct - Nov 97	31 Jul 97
Mandatory 4	DAU Mandatory Training	See DAU Catalog	Various	Various	See DAU Catalog
4	Advanced Program Management Course - DSMC, Ft. Belvoir, VA	GS-13/14	14 weeks	12 May - 15 Aug 97 8 Sep - 12 Dec 97	10 Jan 97 (all) 5 May 97 (CE 9 May)
Non-Mandatory 5	Materiel Acquisition Management (MAM) Ft. Lee, VA	GS-9-13	7 weeks	13 Jan - 7 Mar 97 31 Mar - 23 May 97 21 Jul - 12 Sep 97	2 Dec 96 10 Jan 97 9 May 97
5	Executive Management Course - DSMC Ft. Belvoir, VA	GS-15	3 weeks	3 Mar - 21 Mar 97 25 Aug - 12 Sep 97	3 Jan 97 25 Jun 97
5	Executive Refresher Course - DSMC Ft. Belvoir, VA	GS-15	2 weeks	27 May - 6 Jun 97	25 Mar 97
ATAP 6	Army Tuition Assistance Program (ATAP)	See catalog description	Various	Various	1 Jun 97 9 May 97 (CE) 1 Oct 97
Leader Development 7	Organizational Leadership for Executives (OLE) Ft. Leavenworth, KS	2nd level managers	2 weeks	2 - 13 Dec 96 (KS) 6 - 17 Jan 97 (KS) 10 - 21 Mar 97 (PA) 7 - 18 Apr 97 (KS) 7 - 18 Apr 97 (GA) 28 Apr-9 May (KS) 12 - 23 May 97 (KS) 2 - 13 Jun 97 (KS) 16 - 27 Jun 97 (KS) 7 - 18 Jul 97 (KS) 7 - 18 Jul 97 (PA) 21 Jul - 1 Aug (KS) 4 - 15 Aug 97 (KS) 15 - 26 Sep 97 (KS)	45 - 60 days prior to start date

***See course descriptions for specific eligibility requirements.*

PERSCOM Notes. . .

The Personnel Electronic Records Management System

Assignment officers at the Military Acquisition Management Branch (MAMB) at the U.S. Total Army Personnel Command (PERSCOM) have received many questions related to the Personnel Electronic Records Management System (PERMS)-microfiche from Acquisition Corps officers being considered for promotion. Most of their concerns focus on which documents are authorized for filing, which awards are posted to an officer's microfiche, and what is the best method to review the fiche?

This article serves to answer the following perplexing questions:

- **What is PERMS?**
- **What will PERMS do for you? and**
- **What must you do to prepare your fiche for the next board?**

PERMS-Generated OMPF Microfiche

PERMS is a state-of-the-art automation system utilizing optical digital imagery technology to store and maintain your official Military Personnel File (OMPF) on optical platters at HQDA.

Historical Background

The U.S. Army began maintaining and centrally managing official military personnel records for active duty, reserve, and former Army service personnel in the early 1900s. By the early 1970s, the number of official records being maintained as paper documents had increased astronomically, presenting significant problems for Army records management officials. They required thousands of management and administrative personnel and extensive time to process even routine requests. One of the problems was a lack of record backup in the event of loss or destruction. Although a large number of official personnel records were converted to microfiche by 1980, this was only a partial remedy. Today, the Army's major personnel records centers house more than the equivalent of 200 million pages of official records. Obviously, something had to be done, and today's technology has provided the answer... **PERMS**.

Transition To PERMS

Development of PERMS involved the design, integration, installa-

PERFORMANCE DATA

DOCUMENT	COMMENTS/GUIDANCE
67-8 Series (DA) US Army Officer Evaluation Report	Do not send DA form 67-8-1.
128 (CGSC) Report of Academic Progress	Send forms that report completion of CAS3.
1059 (DA) Service School Academic Evaluation Report	
1059-1 (DA) Civilian Institution Academic Evaluation Report	
1059-2 (DA) Senior Service College Academic Evaluation Report	
1343 (DD) Notification of Change in Service Member's Official Records	Fiche location depends on type of change.
1613 (DA) Cross Reference	Fiche location depends on the subject of the document.
4187 (DA) Personnel Action	Send only those forms that show final action that changes data on the OMPF. File location depends on the type of change.
ABCMR document that approves or denies an evaluation report appeal	Approved appeals will be filed by direction of ABCMR and denied appeals will be filed on the R fiche.
Document that announces the DCSPER Special Review Board or Commander, PERSCOM decision that denies or partially denies an evaluation report appeal	The allied documents will be filed on the R fiche when a HQDA memorandum for record is filed on the P fiche.
HQDA Memorandum for record	Send this document to explain breaks in evaluation periods or for corrections to evaluation reports.
Record of determination for correction of errors on the OMPF	file on the fiche where the correction occurs.
Documents from other than DOD agencies regarding the release of personal information under the Freedom of Information Act	File on the fiche location from which the information was released
Documents granting authority to change personal data	The fiche location depends on the location of the data changed.
Documents concerning nonrated periods in evaluation report records	
Non-Army evaluation reports received by persons when they were members of another service.	

Figure 1.

COMMENDATORY AND DISCIPLINARY DATA

DOCUMENT	COMMENTS/GUIDANCE
12-1 (MFO) Application for Multinational Force and Observers Medals	Send only approved applications.
87 (DA) Certificate of Training	Send only certificates issued by activities listed in DA Pam 351-4.
128 (CGSC) Report of Academic Progress	Send only forms that report 50% completion of course.
1256 (DA) Incentive Award Nomination and Approval	Send only approved record of Special Act/Service Awards granted for scientific achievements and honorary awards per AR 672-20.
1343 (DD) Notification of Change in Service Member's Official Records	Fiche location depends on type of change.
1577 (DA) Authorization for issuance of awards	Send when no order is published.
1613 (DA) Cross Reference	Fiche location depends on the subject of the document.
2442 (DA) Certificate of Achievement	Send the memorandum of award if the certificate is too big to file.
2443 (DA) Commendation Certificate	Send the memorandum of award if the certificate is too big to file.
Certificates of Appreciation	Send the memorandum of award if the certificate is too big to file.
Award orders (including badges, bars, tabs, and so forth.)	Do not forward approved DA Form 638 (unless for downgraded or disapproved awards
Copy of award citation when not included in the award order	a. Ensure order number from block 25b, DA FORM 638 is annotated on certificate below approval authority signature block. b. Handwrite SSN at upper right hand corner of certificate.
Correspondence, authorizations, and orders regarding foreign decorations	
Documents and certificates that award badges, service medals, tabs or non-Army awards for which no orders are published.	
Documents regarding awarding of the Medal of Honor	Also send the recommendation for the award.
Letters, memorandums, and messages of appreciation or commendation	Send correspondence only when signed by an official listed below: a. The President of the United States b. The Vice President of the United States c. The Secretary of Defense d. The Service Secretaries e. Chairman Joint Chiefs of Staff f. Chiefs of Services.
Record of determination for correction of errors on the OMPF	File on the fiche where the correction occurs.
Correspondence by members declining attendance at an Army or other DOD service schools	
Letter of failure to complete an Army service school resident course of instruction	Do not send if academic report was issued for course.
Resident and nonresident course completion certificates	Send only when academic report (DA Form 1059-1) was not issued.
Transcripts of credit from civilian colleges, universities, trade schools, or business schools	JAG, Chaplain, and AMMED officers send completion transcripts; all other officers will not send transcripts to be filed on the fiche (only in CMIF)
Documents granting authority to change personal data	The fiche location depends on the location of the data changed.

Note: *AAM through MSM are all done on DA Form 638. This form is only filed on the service fiche in the general administration (GA) section when the award is downgraded or disapproved. Therefore, if an AAM through MSM is not downgraded or disapproved, ONLY the certificate will be filed in the OMPF C & D (complimentary & disciplinary) section. For Legion of Merit and above, both the permanent orders and certificate are filed.*

Figure 2.

tion and maintenance of an electronic record management system with the following objectives in mind:

- Use of optical digital imaging (ODI) technology to capture, store, and retrieve images obtained from paper, microfiche, or digital media;
- Provide rapid access to, and display of digitized record images stored on optical disks;
- Scan documents from paper or microfiche for entry into the system;
- Provide electronic output to workstations, image printers and computer output microfiche (COM) units; and
- Provide copies of entire records, or specific documents within a record, on paper or microfiche in a timely and efficient manner.

Advantages Of PERMS Over Paper Files And Micrographics

PERMS provides an answer to the problems of records management officials while greatly improving the records management process as follows:

- Reduce storage requirements by storing entire records of approximately 600 soldiers on a single 12-inch optical platter;
- Ability to access a partial or entire record in less than 20 seconds;
- Automate records management functions. Provide connectiv-

ity to mainframe computer systems and communications networks;

• Provide back-up protection for records and documents and preserve document images for active and archival purposes;

• Provide simultaneous access to records by multiple users; and

• Eliminates voids, blackouts and out of sequence images. System's index database will ensure chronological recording of documents despite authorized addition or deletion of document images.

Current Status Of OMPF Conversion To PERMS

All active duty officer and enlisted OMPF microfiche underwent conversion to digitized images and subsequent storage on optical platters during 1995.

Preparation For Your Board File

As recently published in the *Military Acquisition Corps Playbook,* MAMB cannot overemphasize the importance of knowing what a DA board will look at to decide your future and, more importantly, **what you can do to ensure you look your best!**

Active duty officers in a zone of consideration for promotion, command or school selection will receive a copy of his or her PERMS generated OMPF microfiche prior to board consideration. You will be asked to review your file for completeness and accuracy and will be given an opportunity to request correction of errors which may have occurred during conversion. Since OMPF microfiche will be mailed to your home address, it is critical that the home address be correctly recorded on the Officer Record Brief (ORB).

Scrubbing your file can be a stressful and challenging process if you wait until the last minute to begin identifying and correcting problems. By systematically identifying problems early, your Personnel Service Center (PSC) will have sufficient time to make the corrections and your assignment officer can proactively, rather than reactively, prepare your file for the board.

Your board file will include your most recent photo, your ORB and your performance microfiche. Order a fiche if you have not done so within the last year.

The Board Microfiche

The **Performance (P) fiche** is used for filing performance, commendatory, and disciplinary data. **The P fiche is routinely used by career managers and selection boards.** Documents placed on this fiche are limited to those that provide evidence of an officer's demonstrated performance. These documents are used for evaluation and selection purposes.

This fiche is divided into a performance (P) section and a commendatory and disciplinary (CD) section. Performance data are entered on the P fiche from left to right beginning at the upper left corner. CD data are also entered from left to right below the performance data. No other division or arrangement of images is authorized. Documents will be placed in the P or CD sections as they are received by the custodian. When more than one document is received at the same time, they will be filed in chronological order.

Documents will not be obliterated or moved from the P fiche unless directed by an authority authorized to correct or move documents filed on the P fiche. On removal of an evaluation report or any part of a report, a HQDA memorandum for record will be placed in the next unused frame of the fiche. This document is filed to explain breaks in evaluation periods or corrections to evaluation reports.

When enlisted soldiers are appointed as commissioned or warrant officers, their enlisted OMPF will be collocated with their new officer OMPF. The enlisted OMPF, however, will not be transferred to the newly created officer P fiche.

How To Review Your Board Fiche

Place the PERMs fiche in a microfiche reader and place your current photo next to your most recent ORB. First, compare the following data elements for accuracy: NAME, SSN, PHOTO DATE and BASIC BRANCH. Next, review your fiche carefully to ensure that all of your OERs, Academic Evaluation Reports (AERs), and other important documents were successfully transferred. Also, check to ensure that **only your** OERs and AERs are on the fiche and ensure documents that do not belong to you are not included on your fiche.

Ensure that your last OER has been scanned into the PERMS system and that it appears on the fiche. The date of the last OER/AER on the fiche should correspond to the date of the last OER/AER on the ORB. If your last OER is not on your fiche yet, contact your local PSC to ensure the OER was sent to the OER Branch at PERSCOM. Current OERs (within six months) that are not on your fiche will be seen in hard copy by the board. If you are missing an OER that is more than six months old, alert your PSC.

Check to ensure that the OER/AER dates are in chronological order and identify illegible OERs/AERs. Verify previous duty descriptions with OERs for accuracy and ensure CAS3 certificates, CSC and SSC AERs are present. Communicate with your PSC to resolve problems identified.

What's Authorized On The Fiche

Only those documents listed in Tables 2-1 and 2-2, AR 600-8-104 are authorized for filing on the fiche. Review the Performance Data Section (See Figure 1) and the Commendatory and Disciplinary Data Section (See Figure 2).

Please do not wait until the last minute to correct problems you identify during your review. Submit changes directly to your PSC in red or black ink. It is your PSC's responsibility to make changes to the Officer Record Brief.

In The Past

You may have submitted documents to be added to your fiche and your request was complied with. On the other hand, you may have submitted documents to be added to your fiche and your request was either denied or partially complied with. In accordance with Table 2-1, AR 600-8-104, the following documents are not authorized for filing on your fiche:

• Certificates for schools that issue AERs upon course completion or courses/diplomas not listed in AR 351-1, Appendix B, dated Oct. 15, 1987, or DA PAM 351-4, Index 1 or 2, dated Oct. 30, 1992.

• Letters of appreciation or commendation will only be filed when signed by the President or Vice President of the United States, the Secretary of Defense, the Service Secretaries, Chairman, Joint Chiefs of Staff, and Chiefs of Services.

• Copies of OERs/AERs that are not originals and have not been processed through the Evaluations Reports Branch.

• College transcripts are no longer authorized to be filed in the OMPF (exception to this is JAG, Chaplain, and AMEDD personnel only). Transcripts will be maintained in the Career Management Individual File.

• The DA Form 638 is not authorized for file in the OMPF unless the award was disapproved or downgraded. Only the award certificate with the permanent order number on it will be included in your file.

A Final Note

If your record has been flagged for a forthcoming selection board, your document(s) will be forwarded to the DA Secretariat in hard copy for filing in your selection folder.

The fiche Record Services Section does not make changes or corrections to your ORB. This is a Personnel Services Branch function. However, Record Services Section will furnish copies of your ORB upon request. If the PSC is unable to make the necessary changes, we will assist you in getting your ORB and PERMS fiche corrected prior to the board convening.

Officers desiring to review their restricted fiche must request the restricted fiche in writing using the PERMS microfiche request form. Assignment officers do not have access to and cannot order restricted fiche.

We cannot do this alone; you must be involved in this process,

and we must work as a team to ensure the file going before the board affords you the best opportunity for selection.

Acquisition Corps - Leading the Army into the 21st Century!

The preceding article was written by MAJ NICK GUERRA who is the FA 51 Lieutenant Colonel's Assignment Officer in the MAMB at PERSCOM and a member of the Army Acquisition Corps.

1997 Senior Service College Officer Selection Board

A Department of the Army selection board will convene April 15, 1997 to consider eligible officers in the Army competitive category to attend academic year 1998-1999 resident senior service colleges (SSC) and fellowships, SSC foreign schools and academic year 1998-2000 Army War College Corresponding Studies Course (AWCCSC).

Officers who meet the following criteria are eligible for selection to a resident SSC or fellowship, an SSC foreign school, or the AWCCSC:

- Must have not completed more than 23 years (276 months) of Active Federal Commissioned Service (AFCS) and must have completed a minimum of 16 years (192 months) AFCS as of Oct. 1, 1998, and must be a colonel or lieutenant colonel as of the board convene date.
- Promotable majors must be promoted to lieutenant colonel by the board convene date to be eligible.
- Must have credit for completing a command and staff level college (Military Education Level (MEL) 4).
- Must have not attended, received credit for attending, or declined attendance to a resident SSC, SSC fellowship, or an equivalent foreign school.
- Officers enrolled in, graduated, or disenrolled from AWCCSC class 97-99 or later are no longer eligible for consideration.
- Officers with an approved separation date (either from resignation or retirement) are not eligible for SSC consideration by the FY97 SSC board.
- Officers exceeding AFCS eligibility criteria may request additional eligibility by submitting, in writing, a request with adequate justification to the Military Acquisition Management Branch (MAMB), U.S. Total Army Personnel Command (PERSCOM). The request does not require command endorsements. An example of adequate justification may include (but is not limited to) the fact that previous SSC boards did not consider the officer's entire lieutenant colonel command (or equivalent) file. Requests of this nature should have been received by PERSCOM no later than March 1, 1997.
- The Evaluation Reports Branch, PERSCOM (TAPC-MSE-R) must receive all evaluation reports (complete-the-record, required, or optional), error free, by April 8, 1997, for the report to be considered by the SSC selection board. The required thru date for complete-the-record reports will be Feb. 7, 1997, (note the 180-day minimum time requirement).

In January, PERSCOM sent out pre-board packets to the home address of officers being considered by the SSC board. This packet included a board officer record brief, Microfiche, and a checklist. Eligible officers should carefully review their files using the checklist provided and resolve problems early. Officers who meet the consideration criteria above and have not received a pre-board packet should contact their assignment officer immediately. For more information, contact the lieutenant colonel assignments officers at MAMB, PERSCOM:

- **MAJ John Tidd, FA53/97:** (703)325-3124, DSN 221-3124, or e-mail tiddj@hoffman-emh1.army.mil; and
- **MAJ Nick Guerra, FA51:** (703)325-3129, DSN 221-3129, or e-mail guerran@hoffman-emh1.army.mil.

FY 96 Colonel's Board

What the Results Indicate

With the release of any promotion list, there follows an exhaustive data analysis period to "map" any characteristics of the considered/selected population. The initial analysis of the FY 96 colonel's list was recently completed with some interesting revelations. The following article summarizes these results and, where appropriate, indicates possible trends.

Overall Acquisition Corps Results

Board members reviewed the files of 63 Acquisition Corps officers in the *primary zone*. From this population, the board selected 20. The resulting selection rate of 31.7 percent was considerably lower than the Army Competitive Category selection rate of 41.2 percent. In addition, the board selected one AAC officer from above the zone and one from below the zone. The low selection rate indicates that the Acquisition Corps met the minimum requirement of 22, established as a floor by the Deputy Chief of Staff for Personnel. Although the files of AAC officers continue to be competitive when compared to those files of basic branch officers, the reality that the AAC currently has more colonels and lieutenant colonels than can be supported by requirements was a factor in the lower selection rate for AAC officers. The current initiatives to downsize the AAC should return the Corps to healthy promotion rates for future boards.

Acquisition Corps results (PZ) by functional area are as follows:

Functional Area	*Considered*	*Selected*	*Percent*
51	35	11	31.4
53	13	4	30.7
97	15	5	33.3

Who Got Promoted?

Of the 20 officers selected (PZ), 19 were current or previous centrally selected product managers or acquisition commanders. Two officers are currently serving as product managers. Two selectees were previous contracting commanders with two currently serving at the time of the board. One officer had previously served in an acquisition (test) command. Only one of the selectees had not previously been selected for senior service college (SSC) resident or corresponding studies.

Trend

Based on the analysis applied to the above information, it is apparent that those officers who complete a successful PM/command (1 block OER with supportive write-up from senior rater) are selected for continued service as colonels. The inflation of our current OER requires "top block above center of mass" performance as a PM/commander. The fact that only one officer was selected who was not a senior service college graduate (or currently attending) indicates that SSC completion is now as important as top block PM/command reports.

Who Did Not Get Promoted?

There were a total of 43 officers in the primary zone who were not selected for promotion to the rank of colonel. After examining this population's assignment demographics we found 15 former or serving PMs/commanders. Twenty-eight of the non-select officers did not serve as either a PM or acquisition commander.

Looking at the non-select population from a senior service college standpoint, there was one officer who was attending resident SSC, five resident selectees, three non-resident selectees and one

was a non-resident graduate. One officer is currently an AWCCSC enrollee.

Trend

Clearly, CDPL selection and success as a LTC-level PM/commander are the key to competing for promotion to colonel. Late selection for LTC PM/command (especially when the board sees no "command" reports, or only one report covering a short period of time) can lead to non-selection. In the past, a few of these officers have been selected "above-the-zone" by subsequent boards. This year's board found sufficient successful PM/commanders in the primary zone and selected only one AAC FA 53 officer above the zone and one AAC FA 51 officer below the zone.

General Observations

The file quality for officers selected for promotion continues to improve. The competition for promotion is tough, with insufficient colonel requirements in the AAC to promote all successful PM/commanders.

Early selection and slating for PM/command is essential. In order to meet this "gate," one must seek out those positions which will branch qualify an officer as a major. For product managers, previous PM and SARDA duty constitute "branch qualification." Contracting officers require a depth of contracting experience and training. Success in other acquisition positions provides overall file strength to support selection.

During the most recent LTC PM/command selection board, the members of the board placed most of their emphasis on the "potential" comments provided by senior raters. Those officers having good, quantitative potential comments appeared to emerge more competitive than those whose OERs did not contain these comments.

As future promotion boards approach, it is imperative for officers in all zones of consideration to take the time to personally "scrub" their ORB to ensure accurate information is conveyed to the board members. Do not forget about your photo. It is recommended that if a photo is more than three years old, then it is time for a new one. Check your awards, insignia (branch and U.S.), etc. Attention to detail on your official photograph does make a difference.

Finally, as a captain or major, seek career broadening experiences to become competitive for early selection as a PM/commander. Seek out the hard jobs and do them well. With limited positions in the PEO/PM organizations and contracting activities (DCMC and AMC), we, in PERSCOM, will rotate many of our captains and majors at as little as 24 months time on station where required to ensure an opportunity for more AAC officers to be fully qualified going into the LTC PM/command board. While we will continue to support valid operational deferments when it is in the best interest of the Army, AAC, and officer, our goal is to ensure that AAC officers reach their first look for LTC PM/command fully "branch qualified."

48 Graduate From MAM Course

On Dec. 6, 1996, 48 students graduated from the Materiel Acquisition Management (MAM) Course, held at the U.S. Army Logistics Management College, Fort Lee, VA. The graduates included foreign officers from Slovenia and the Philippines.

Research and development, testing, contracting, requirements generation, logistics and production management are examples of the materiel acquisition work assignments being offered to these graduates.

The Distinguished Graduate Award was presented to MAJ John Swart, Student Detachment, Fort Jackson, SC.

The seven-week MAM Course provides a broad knowledge of the materiel acquisition function. It covers national policies and objectives that shape the acquisition process and the implementation of these policies and objectives by the U.S. Army. Areas addressed include acquisition concepts and policies; research, development, test and evaluation; financial and cost management; integrated logistics support; force modernization; production management; and contract management. Emphasis is placed on developing mid-level managers so they can effectively participate in the management of the acquisition process.

From The Acquisition Reform Office...

Army Acquisition Website Gets New Facelift

The Army Acquisition Website recently received a facelift. The new site offers quick and easy access to pertinent information, comprehensive on-line information, and searchable databases, as well as up-to-date information. The website, which is sponsored by Dr. Kenneth J. Oscar, the Deputy Assistant Secretary of the Army (Procurement), has been redesigned and is now on-line. It sports a new color scheme and format layout. The purpose of the redesign is to increase the ease of using the homepage and to ensure that it provides valuable acquisition and contracting information to our acquisition professionals. The goal of the website is to be a resource hub that supports the acquisition community with readily available and meaningful information which can be used to assist and add value to daily work environments. One of several icons, the *Acquisition Reform (AR)* section includes:

- AR Office/Organization Information;
- Improvement Initiatives;
- Newsletters;
- Recent AR Papers, Policies, and Briefings;
- Questions and Answers;
- Upcoming events/training opportunities; and
- Links to other federal, DOD and other Services.

Visit the new website at http://acqnet.sarda.army.mil.

The Procurement Management Assistance Program Revamped

The Army's new Procurement Management Assistance Program (PMAP) is designed to provide management consultant-type services to enhance and assist the procurement process. The new PMAP stresses communication and assistance Army-wide. It will emphasize goal setting, strategic planning, metrics and the flow of information throughout the Army. The objective of the PMAP is to provide outcome-based analyses and assessments of the effectiveness and efficiencies of Army procurement operations, procedures, practices and organizations. It will focus on identifying problems and solutions to solve them. The PMAP will also address improvements in contracting policies and procedures and communicate these throughout the Army.

The U.S. Army Contracting Support Agency is responsible for the administration and conduct of the PMAP. Its PMAP Team will be the "eyes and ears" of Army leadership to identify best practices, lessons learned, issues and trends that affect the Army as a whole. To ensure continual improvement in the procurement process, the PMAP findings will be communicated Army-wide on a non-attribution basis.

ASB Tackles "Barriers To Implementation Of AR"

The Army Science Board's (ASB) Acquisition Reform (AR) Issues Panel is pursuing a study titled, "Barriers to the Implementation of Acquisition Reform." The study is sponsored by Dr. Kenneth J. Oscar, Deputy Assistant Secretary for Procurement. The terms of reference for the study consist of:

- Identifying the key persons by position or function who influence acquisition reform the most;
- Investigating barriers to acquisition reform (which may be attitudinal, behavioral, political, organizational or cultural); and
- Analyzing government approaches to overcoming impediments.

The panel will recommend approaches to overcome the barriers and suggest any new ideas for reform. The study is expected to continue through August.

The FY 97 Army Roadshow Program

The FY 97 Roadshow series is underway with two separate offerings—**"Roadshow VI" and "Roadshow V-97."** Roadshow VI focuses on the needs of the Army Materiel Command (AMC) and its acquisition and logistics community, and primarily deals with sustainment and spares issues. It will be offered in the same format as past Roadshows—an executive session with senior acquisition leaders; a DOD/industry question-and-answer panel; and core and elective modules. Roadshow VI modules, electives, and locations are listed below and are current as of December 1996.

NOTE: Please keep in mind that the offerings, dates and locations are subject to change.

CORE MODULES

Lectures

- Investment Efficiencies
- Secondary Item Requirements Determination
- Secondary Item Pricing

Workshops

- Improving Effectiveness Of Logistics IPTS
- Supply Control Study

ELECTIVES

- Performance Based Spares Contracting
- Lead Time Reduction
- Operations & Support Cost Reduction (OSCR)
- Streamlining Logistical Contract Requirements
- Reducing Life Cycle Costs

DATE	MACOM	LOCATION
25-28 Mar 97	CECOM	Monmouth, NJ
22-25 Apr 97	TACOM	Warren, MI
6-9 May 97	IOC	Rock Island, IL

The other Roadshow offering is dubbed **"Roadshow V-97"** and is somewhat different from past Roadshows. With "Roadshow V-97", the sponsoring activity determines the modules to be offered, length of the Roadshow (dependent on number and level of instruction, i.e., discussion, caseletts or case studies), and location. The sponsoring activity or customer is offered a "menu" of modules from which to choose (these can be further tailored) to meet the needs of the activity, i.e., medical, construction, privatization, etc. Two MACOM requested modules—"Direct Health Care Services" (MACOM) and "Privatization" (FORSCOM)—also will be developed.

The **"Roadshow V-97"** Module Menu follows:

- Implementing SAP/FACNET
- FARA/ITMRA
- Commercial Item Solicitation Preparation
- Implementing Cost/Price and Past Performance
- Implementing Changes To Contract Award and Follow Up
- Cost Principles, Financing and Other Changes
- Improving Effectiveness Of IPTs
- Contracting Alternatives
- Best Value
- Performance Based Service Contracting
- Presolicitation Analysis Streamlining
- Task/Job Order Contracting
- Funds Management

** Direct Health Care Providers (MEDCOM)
** Privatization (FORSCOM)
** Contingency Contracting (AEUCC)
** Deskbook Demonstration Booth

The ***proposed*** schedule for "Roadshow V-97" follows:

DATE	MACOM	LOCATION
4-6 Mar 97	MEDCOM	Seattle/Tacoma
15-17 Apr 97	FORSCOM	Atlanta, GA
28-29 Apr 97	MEDCOM	El Paso, TX
1-2 May 97	COE	Orlando, FL
13-15 May 97	INSCOM/MDW	Washington, DC
20-22 May 97	TRADOC	So. Virginia
3-5 Jun 97	AEUCC	Germany

Planning for Roadshow '98 began in January 1997. If you have questions, or if you would like to contribute your thoughts, ideas or recommendations, please contact the Army Roadshow representative, Susan Erwin at commercial (703)681-9292 or DSN 761-9292.

Army Procurement Conference
A "Resounding Success"

The 1996 Worldwide Army Procurement Conference, held in Alexandria, VA, Nov. 18-22, 1996, has been rated a tremendous success by all attendees. The conference was hosted by Dr. Kenneth J. Oscar, Deputy Assistant Secretary of the Army (Procurement) and the theme was "Beyond Acquisition Reform." Participation by Honorable William J. Perry, then Secretary of Defense, as keynote speaker, greatly enhanced the proceedings. GEN Joseph Ralston, Vice Chairman of the Joint Chiefs of Staff, provided the banquet address, and Dr. Lawrence Korb, Director, Brookings Institution, provided insights into the political landscape and how the players in the process can impact acquisition reform regulations and statutes. The three-phased conference covered contingency contracting, improvements in contracting methods and procedures, and career management.

Hands-on training exhibits were provided on NISH (formerly National Industries for the Severely Handicapped), National Industries for the Blind (NIB), Single Process Initiative (SPI), Past Performance Information System (PPIS), Non-Developmental Items (NDI), Army Acquisition Corps (AAC), SARDA Home Page, and Deskbook.

The conference far exceeded its purpose of furnishing guidance on new acquisition policy and techniques; highlighting what's working and what's not with acquisition reform; exploring opportunities for improvement in contracting methods and procedures; and providing techniques on rebuilding the morale and productivity that have affected our workforce by the many changes. Overall, the facilitation of the exchange of information among senior contracting and legal personnel of the Army's global acquisition operations paves the way for more effective and efficient contracting as we approach the 21st century.

Hats off to the U.S. Army Contracting Support Agency Planning Committee and to the more than 200 participants for making the 1996 Army Procurement Conference a resounding success!

Electronic Commerce/Electronic Data Interchange In Contracting Conference
Past, Present, and Future

The Deputy Assistant Secretary of the Army (Procurement) and Electronic Commerce Resource Centers (ECRC) of Fairfax, VA, and San Antonio, TX, co-sponsored "The U.S. Army's Second EC/EDI in Contracting Conference" Dec. 9-11, 1996, in San Antonio, TX. Conference participants included acquisition professionals, small business personnel, industry and Value-Added Networks (VANS) representatives. Guest speakers included Dr. Kenneth Oscar, Deputy Assistant Secretary of the Army (Procurement); MG David Kelley, Vice Director of Defense Information System Agency (DISA); BG Timothy Malishenko, Director for Contracting, Air Force; and COL Elton Minney, Director for Contracting, Army. These, and other government and industry speakers, provided exciting information that will help us conduct procurement activities via the Federal Acquisition Network (FACNET) and the INTERNET.

DISA representatives, LTC George Bettis and LTC Mike McFarren, provided an update on the Electronic Commerce Processing Node (ECPN) and how it will improve FACNET transaction processing time. DISA switched to the new ECPN on Nov. 1, 1996. This new node will allow DISA to process up to 1.5 million transactions per day vs. 100,000 transactions under the previous processing node (NEP). Contracting activities should see a significant decrease in FACNET transactions processing time (end to end).

Likewise, Procurement Net (PROCNet), a home-grown automated procurement system developed by Holley Heniz and Joseph Sheng of TACOM-ARDEC, is equally promising. This system is currently being used for procurement purchases above $100,000 at Picatinny Arsenal, NJ. It uses the INTERNET to transmit solicitations to a bulletin board. From there, a potential trading partner can respond to the solicitation via INTERNET. Proposal information can be encrypted to protect proprietary material if desired. PROCNet is also capable of sending small technical drawings via the INTERNET; large technical drawings can be forwarded via CD ROM if requested. This process alone will save many trees and, potentially, hundreds of dollars in mailing costs.

A key theme throughout the conference was that no **one** organization or individual owns or controls the automated procurement process we are embarking upon. We all must play an active role. The fast-paced computer age has fully engulfed the procurement process, requiring that we become proactive problem solvers as we continue to automate procurement activities which will enable us to work smarter, faster, and more efficiently in support of our number one customers—*SOLDIERS.*

Acquisition Reform Day 2

The Honorable Paul Kaminski, Under Secretary of Defense (Acquisition and Technology), has designated March 19, 1997, as "Acquisition Reform Day 2." This follows DOD's successful Acquisition Reform Acceleration Day conducted last May. Dr. Kaminski is requesting that all DOD acquisition organizations focus during this day on ways to accelerate and institutionalize acquisition reform. The theme of this year's activities is "Teaming—The Catalyst for Making Acquisition Reform Initiatives the Norm." The focus of these activities will be conducting team training at the local level. Local activities will be asked to engage all key players in their acquisition environment, including industry. DOD is planning to take the case studies/"war games" developed for the Army's Roadshows and revise them, if necessary, for use throughout DOD.

For additional information on this article, contact LTC L. Hooks on (703)697-2558 or e-mail: booksl@sarda.army.mil.

CONFERENCES

Engineer Center Hosts 2 Conferences

The U.S.Army Engineer Center, Fort Leonard Wood, MO, will host two concurrent conferences April 29-May 2, 1997: Engineer Force XXI (ENFORCE XXI-97), and the U.S. Army Corps of Engineers (USACE) District Commander's Conference.

Participants will include active and reserve component brigade, group, and battalion commanders and their command sergeants major, USACE commanders, Corps and MACOM engineers, directors of public works, active and reserve component advisors to engineer units, and the service schools' engineer representatives. Special invitations are extended to the U.S.Air Force, U.S. Navy, and Marine Corps engineers to incorporate joint Service concerns.

The principal objective of the ENFORCE XXI-97 conference is to prepare engineer leaders for 21st century requirements and challenges by demonstrating emerging technologies, tactics, techniques and procedures for all operations that will enhance the effectiveness of the 21st century engineer force. This endeavor will be accomplished through various media, including a comprehensive tactical demonstration, hands-on displays, selected guest speakers, and focused work groups.

Invitation packets will be mailed on or about March 7, 1997. Additional information is available on the Fort Leonard Wood home page, http://www.wood.army.mil. Questions can be sent to the ENFORCE XXI Project Officer, CPT Mark Maciel, via e-mail to macielm@wood-vines.army.mil or by calling commercial (573)563-7015, or DSN 676-7015.

NEWS BRIEFS

Army Celebrates 50 Years of Computing

The Army Research Laboratory (ARL) at Aberdeen Proving Ground, MD, and the Army Ordnance Center and School sponsored a ceremony celebrating the Army's role in the computer revolution which began 50 years ago. That role began in 1946 with a mammoth computer called the Electronic Numerical Integrator and Computer (ENIAC) and continues today in the form of an ARL Major Shared Resource Center (MSRC)—part of the Department of Defense High Performance Computing Modernization program.

Few inventions have had as big an impact on our civilization as the computer, and all modern computers descended from ENIAC—the first operational, general-purpose, electronic digital computer. Pursued by the Army as a means to speed up calculations required to produce firing tables, ENIAC was first used to solve an important problem for the Manhattan Project. ENIAC provided a platform for testing major component concepts, and its success stimulated the development of other machines, leading to the build-up of the modern computer industry and the pervasive presence of computers in everyday life.

The Aberdeen ceremony gave credit to the highly skilled and dedicated military civilian scientists and other workers whose efforts met and solved a great national Defense challenge and gave birth to a technology which would change the world. Closing the ceremony was a ribbon-cutting, dedicating the ARL MSRC. Thirty-three of the original computer pioneers attended and were honored for their work, including Dr. Herman H. Goldstine, the project officer of the ENIAC program; the family of COL Paul N. Gillon (USA-Ret.), who was an ENIAC team staff officer; and the family of John L. von Neumann, an innovative and influential scientist and a member of the Scientific Advisory Board of the Ballistic Research Lab (BRL). Some elements of the former BRL have since been absorbed by ARL.

Today the ARL MSRC is one of four such centers around the country in the DOD High Performance Computing Program. The center is a cornerstone of the modernized Defense R&D computational capability. It will house leading edge, full spectrum suites of high performance computing platforms along with the expert staff to make these resources fully available to the DOD user.

For more information, contact Connie Gillette, ARL Public Affairs Officer, cgillette@arl.mil, (301) 394-3590, or Angie Levrone, alevrone@arl.mil, (301) 394-3591. The ARL ENIAC Web Site is at http://ftp.arl.mil/~mike/comphist/.

AAC PLAYBOOKS AVAILABLE

The *Military Acquisition Corps Playbook '96* and the *Army Acquisition Corps Civilian Playbook* are now available for members of the Army Acquisition Corps and the Army Acquisition Workforce. These playbooks were created as annual publications to outline the building blocks for a successful career in acquisition and to provide information about the unique and exciting opportunities available for acquisition professionals.

To request copies, contact Peggy Mattei at:

Commercial (703)614-3725
DSN 224-3725, or e-mail:
matteip@sarda.army.mil

The playbooks are also now available on the AAC Homepage at:

http://dacm.sarda.army.mil

NEW PHONE NUMBERS FOR *ARMY RD&A* MAGAZINE

The *Army RD&A* magazine editorial office has changed its phone numbers. Effective immediately, our new phone numbers are:

Harvey Bleicher, Editor-in-Chief	(703)805-1035
Melody Barrett, Managing Editor	(703)805-1036
Debbie Fischer, Assistant Editor	(703)805-1038

The DSN prefix, 655, remains the same, as does our fax number, (703)805-4218 or DSN 655-4218.

BOOKS

The Gulf War And Mental Health

The Gulf War and Mental Health, A Comprehensive Guide is a collection of papers recently published on military mental health services during and after the Gulf War. It was edited by retired COL James A. Martin, formerly assigned to Walter Reed Army Institute of Research (WRAIR); COL Gregory Belenky, Director, Division of Neuropsychiatry, WRAIR; and Linnette Sparacino, Medical Editor at the Borden Institute. This publication—*ISBN 0-275-95631-8*—is available from Praeger Press, a subgroup of Greenwood Publishing Group, 88 Post Road West; P.O. Box 5007; Westport, CT 06881-5007. The toll free order number is (800)225-5800; information (203)226-3571; fax (203)222-1502.

The Powder Keg—An Intelligence Officer's Guide to Military Forces in the Middle East 1996-2000

By MG Edward B. Atkeson (USA Ret.), Nova Publications, Falls Church, VA.

Reviewed and submitted by Joe Sites, BRTRC.

MG Atkeson did an enormous amount of research for this 200-page book on the Middle East. He expresses the results of his research and his own perceptions with exceptional clarity. The importance of the Middle East to our Armed Forces is highlighted through reference to the President's 1994 National Security Strategy, which stated that U.S. forces might be deployed worldwide in accomplishing the following tasks:

- Dealing with major regional contingencies;
- Providing a credible overseas presence;
- Countering weapons of mass destruction; and
- Supporting counter-terrorism efforts and other national security ojectives.

Intuitively, the average reader will understand that each of the listed tasks has direct application in the Middle East. By providing an overview of the area, and listing in detail the current and projected military capabilities of each nation in the area, Atkeson spells out in bold print why our intuition is right. Not only does he list the numerical data on how much military equipment by type and model each Middle East nation has and expects to have, the author provides scenarios on why and how this equipment may be used.

Operations personnel who are doing detailed work on operational plans will find this book helpful in providing an insight into the overall situation in the Middle East as it relates to the military. Logisticians and personnel working in international sales will obtain a better understanding of military equipment needs as perceived by each of the diverse nations in the Middle East. The author further highlights that the potential conflicts in the area are not two-sided. They are multi-faceted. In one situation a given country (A) will find itself allied with another (B), but in a conflict between B and C, A may well find that it is an ally of C. There are eight major states and six minor states in the area. These states, since their creation, and their people, even before the creation of the states, have had problems with each other. The problems include artificial boundaries, religion, leadership, distribution of resources and tribal differences. Given the number of states and number of problems, the combinations and permutations for conflict seem endless.

In summary, *Powder Keg* is filled with many facts, easy-to-read tables and succinct presentations on this area which is relatively small in geographical size and population, but huge in its importance to the world's economy and as a source of potential conflict with wide-reaching implications. Once read, *Powder Keg* should be retained as a ready reference.

MEDICAL NEWS

• **Strategic Alliance**. BG Russ Zajtchuk, Commanding General, U.S. Army Medical Research and Materiel Command (USAMRMC), and Dr. Florabel Mullick, Director, Center for Advanced Pathology, Armed Forces Institute of Pathology (AFIP), signed a memorandum of agreement late last year to formalize collaboration between the two organizations in consultation, education and research. As a recognized authority in medical research and education, the USAMRMC offers well-established programs and research laboratories in medical applications and education. The opportunity to work with scientists at these facilities will greatly enhance AFIP consultative, education and research program areas. Conversely, the possibility of expanding USAMRMC programs by including telemedicine, telepathology and other pathologic research aspects available at the AFIP is in the research interest of the USAMRMC.

• **Partnership and Education.** The USAMRMC and the University of Maryland School of Medicine have established a "Partnership in Education." The objective of this partnership is to encourage and enhance study in the scientific disciplines and, in particular, in the areas of telemedicine, medical informatics, and science and technology education. Under this partnership, the USAMRMC may loan equipment or transfer surplus equipment to the university, make command personnel available to teach or to help plan courses, involve faculty and students of the university in command projects, develop programs with the university in which students can receive academic credit for work on command projects, and provide academic and career advice or assistance to university students.

PERSONNEL

Williams Joins Acquisition Career Management Office

The Army Acquisition Career Management Office, Office of the Assistant Secretary of the Army (Research, Development and Acquisition), is pleased to announce the arrival of MAJ Yancey Williams, who will serve as the Functional Area 51 (Research, Development and Acquisition) Proponency Officer and the Army Acquisition Corps Military Acquisition Position List Manager. Williams served previously as the Executive Officer, PEO, Armored Systems Modernization; Assistant Project Manager—Combat Mobility Systems; and Assistant Product Manager—Abrams M1A1 Tank System. He has also served at Aberdeen Proving Ground as a live-fire test officer and Chief of the PM Abrams Field Office. Williams holds a B.S. in general engineering from the U.S. Military Academy, an M.S. in materiel acquisition management from the Naval Postgraduate School, and is a graduate of the Command and General Staff College and the Materiel Acquisition Management Course.

ARMY RD&A WRITER'S GUIDELINES

About Army RD&A

Army RD&A is a bimonthly professional development magazine published by the Office of the Assistant Secretary of the Army (Research, Development and Acquisition). The address for the Editorial Office is: DEPARTMENT OF THE ARMY, ARMY RDA, 9900 BELVOIR RD SUITE 101, FT BELVOIR VA 22060-5567. Phone numbers are: Commercial (703)805-1035/1036/1038 or DSN 655-1035/1036/1038. Datafax: (703)805-4218 or DSN 655 4218. E-mail addresses for the editorial staff are as follows:

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Purpose

To instruct members of the RD&A community relative to RD&A processes, procedures, techniques and management philosophy and to disseminate other information pertinent to the professional development of the RD&A community.

Subject Matter

Subjects of articles may include, but are not restricted to, policy guidance, program accomplishments, state-of-the-art technology/systems developments, career development information, and management philosophy/techniques. Acronyms should be kept to a minimum and, when used, be defined on first reference. Articles with footnotes are not accepted.

Length of Articles

Articles should be approximately 1,500 t o 1,600 words in length. This equates to approximately 8 double-spaced typed pages, using a 20-line page.

Photos and Illustrations

Include any photographs or illustrations which complement the article. Black and white is preferred, but color is acceptable. Graphics may be submitted in paper format, or on a 3 1/2-inch disk in powerpoint, but must be black and white only, with no shading, screens or tints. We cannot promise to use all photos or illustrations, and they are normally not returned unless requested.

Biographical Sketch

Include a short biographical sketch of the author/s. This should include the author's educational background and current position.

Clearance

All articles must be cleared by the author's security/OPSEC office and public affairs office prior to submission. The cover letter accompanying the article must state that these clearances have been obtained and that the article has command approval for open publication.

Submission Dates

Issue	*Author's Deadline*
January-February	15 October
March-April	15 December
May-June	15 February
July-August	15 April
September-October	15 June
November-December	15 August

Authors should include their address and office phone number (DSN and commercial) with all submissions, **as well as a typed, self-adhesive label containing their correct mailing address**. In addition to providing a printed copy, authors should submit articles on a 3 1/2-inch disk in MS Word, or ASCII format. Articles may also be sent via e-mail to: bleicheh@aim.belvoir.army.mil

1996 INDEX OF ARTICLES

This index is a headline listing of major articles published in *Army RD&A* during 1996.

JANUARY-FEBRUARY

- Refining The Source Selection Process: TACOM's Source Selection Initiative
- Pacer Acquisitions: DOD Vision Becomes A Reality At CECOM
- A Model For Procurement Success: The Comanche Program
- The Deployable Universal Combat Earthmover
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